

**Semmelweis University**  
**Department of Anatomy, Histology and Embryology**  
**2020/2021**

**Faculty of Dentistry**  
**1<sup>st</sup> year, 2<sup>nd</sup> semester**

**HANDBOOK**  
**Macroscopic Anatomy II**  
**Microscopic Anatomy and Embryology I**



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# Anatomy, Histology and Embryology for Dentistry students

## TEACHING DEPARTMENT:

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## LEARNING OBJECTIVES

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

### Lectures:

First semester: 1x 45 min (Macroscopic Anatomy I) ; second semester: 2x 2x45 min (Macroscopic Anatomy II and Microscopic Anatomy and Embryology I) third semester: 2x 45 min (Microscopic Anatomy II)

### Topics:

**First semester:** Gross anatomy of the bones, joints and muscles; central and peripheral nervous systems and meninges

**Second semester:** Morphology of the heart and vessels, thoracic/abdominal/pelvic viscera, body cavities and serous membranes. Sectional anatomy of the thorax, abdomen and pelvis. Description of the diaphragms. Maxillofacial Anatomy, organs, cavities, nervous and vascular supply of the head and neck regions, including topographical and cross sectional anatomy.

General embryology, general histology (basic tissues). Histology and embryology of the heart and vessels, gastrointestinal and urogenital organs. Maxillofacial Histology and Embryology.

**Third semester:** Development of the skull, spine and limbs. Histology and embryology of the lymphatic system, central and peripheral nervous system together with the organs of special senses and endocrine organs. Microscopy of the CNS.

## **RULES AND REGULATIONS IN THE DISSECTING ROOM**

**IT IS STRICTLY FORBIDDEN to eat, drink, smoke, to chew gums, or to use music devices. No telephone calls, please.**

**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 conforming to the spirit of the site in the dissecting room. 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 put away in your personal bag. Fresh lab coats are provided every 2<sup>nd</sup> week or when necessary.

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.

**NO RECORDINGS ARE ALLOWED WHILE IN THE DISSECTION ROOM.**

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!**

# ED I. Macroscopic Anatomy 2

## ANNOUNCEMENTS

### *Subject matter of the 2nd semester*

#### **I. Macroscopy of the cardiovascular system**

- heart
- blood vessels in general
- pulmonary circulation
- systemic circulation
- veins

#### **II. Macroscopy of internal organs**

- gastrointestinal tract
- respiratory tract
- urogenital tract
- separation of body cavities, peritoneum
- pelvic floor, perineum

#### **III. Maxillofacial Anatomy**

- morphology of the structures of the head & neck region
- morphology of teeth

### ***Acceptance of the semester***

Active participation in dissection room lab sessions is obligatory. Students should attend at least 75% of the scheduled hours, as well as successfully passing (**with a mark 2**) the obligatory midterm test, to gain a signature proving the validity of the semester. Absences are therefore limited in 25%.

### ***Obligatory midterm test***

**Date: Week 9, April 13**

**Topics:** Internal organs: Cardiovascular, gastrointestinal and respiratory tracts (except for the head&neck region), retroperitoneum, urogenital system, perineal region

*In case of absence, or an unsuccessful midterm result, students will have to attend a retake exam (TBA). The semester is only accepted if the midterm is successfully passed (with at least a mark 2).*

### ***Non-obligatory practical assessments***

**Date: Week 14, May 21. last practical class**

**Topics :** \*Upper and lower limbs

\*Internal organs (except for the viscera of the head & neck region)

**\*Exemptions:** Students earning marks 3, 4 or 5 in the non-obligatory practical assessments **may request** an exemption from the relevant practical parts of the final examination. Here their marks will be counted in the result of the final examination upon successfully passing the written part.

### **Exam competition**

We invite our students having a valid mark from the 1st semester to participate in a written competition test from the topics of the 2 semesters of the subject. Students achieving good marks (4 or 5) at the test may be exempted from written part of the final examination. The best 5 students are invited to participate in a Macroscopy pin test to determine the final order of competitors.

### **Final examination**

**Topics:** Subject matter of the two semesters of Macroscopic Anatomy

Only those students are eligible to sit for the final examination who have successfully finished their dissection task

#### **The final exam consists of practical and theoretical parts:**

1. Written pretest (Macroscopic Anatomy questions)
2. Oral examination (Identification of structures on anatomical prosections, including relevant theoretical questions)

#### **Marking system**

The final result of the examination is calculated from 5 partial marks

1. Written test (unless exempted)
2. \*Limbs
3. \*Internal organs (except for those in the head&neck region)
4. Maxillofacial Anatomy specimens
5. Macroscopy of the central nervous system (brain and spinal cord)

## Macroscopic Anatomy II. Schedule

Week	Lectures	Practical sessions
	<i>Tuesday 8.00-9.40 (Lenhossék Lecture Hall)</i>	<i>Tue 16.00-17.30; Wed 10.20-11.50; Fri 13.00-14.30</i>
<b>Week 1</b> 02.15-19.	1. Thoracic cavity, mediastinum. Morphology of the esophagus, trachea and the lung. Pleura ( <i>Gerber</i> ) 2. Chambers of the heart, external features. Structure of heart wall, valves, fibrous skeleton ( <i>Kozsurek</i> )	Dissection of the ventral regions (cadaver), opening of the thorax Morphology of the heart
<b>Week 2</b> 02.22-26.	3. Cardiac vessels, conducting system. Surface projection. Auscultation points. Pericardium. ( <i>Kozsurek</i> ) 4. Stomach and small intestines (duodenum, jejunum, ileum) ( <i>Ádám</i> )	Dissection of the ventral regions (cadaver) Morphology of the heart
<b>Week 3</b> 03.1-5.	5. Liver, gall bladder, pancreas, spleen. ( <i>Ádám</i> ) 6. Large intestine, rectum. Portocaval anastomoses ( <i>Alpár</i> )	Dissection of the ventral regions (cadaver) Morphology of the heart
<b>Week 4</b> 03.8-12.	7. Peritoneum, peritoneal recesses, peritoneal relations of abdominal organs. ( <i>Szél</i> ) 8. Morphology of the kidney, capsules of the kidney, ureter, urinary bladder. Organs, vessels and nerves of the retroperitoneum ( <i>Gallatz</i> )	Dissection of the ventral regions (cadaver), opening of the abdominal cavity. Celiac trunk, duodenum
<b>Week 5</b> 03.15-19	9. Morphology and coats of the testicle ( <i>Barna</i> ) 10. Morphology of the epididymis, spermatic cord, seminal vesicle and prostate ( <i>Vereczki</i> )	Branches of the superior mesenteric artery Dissection of the retroperitoneal organs
<b>Week 6</b> 03.22-26.	11. Morphology of penis and male urethra. Male perineum ( <i>Pálfi</i> ) 12. Ovary, Fallopian tube and uterus ( <i>Lendvai</i> )	Male genital system Pelvic floor
<b>Week 7</b> 03.29-04.02..	13. Vagina, female perineum, external genital organs ( <i>Alpár</i> ) 14. Blood supply and lymphatic drainage of the abdomen and lesser pelvis ( <i>Kocsis</i> )	Female genital system
<b>Week 8</b> 04.05-09.	15. Muscles of facial expression, muscles and triangles of the neck, cervical fasciae ( <i>Gerber</i> ) 16. Temporomandibular joint, muscles of mastication ( <i>Gallatz</i> )	Lesser pelvis Perineum
<b>Week 9</b> 04.12-16.	17. Oral cavity, tongue, hard and soft palates ( <i>Gerber</i> ) 18. Faucial isthmus, pharynx ( <i>Shahbazi</i> )	<b>MIDTERM</b> : Gastrointestinal system, respiratory tract, (except for the head and neck region), urogenital system, retroperitoneal organs, perineum. ----- Muscles of facial expression, neck muscles, muscles of mastication, temporomandibular joint
<b>Week 10</b> 04.19-23.	19. Nasal cavity, paranasal sinuses, larynx ( <i>Székely</i> ) 20. Tooth morphology ( <i>Gerber</i> )	Oral cavity ,teeth, tongue, Nasal cavity Pharynx, larynx Dissection of the temporal region
<b>Week 11</b> 04.26-30.	21. Radiological anatomy of the oral cavity (maxilla, mandible, maxillary sinus, teeth) ( <i>Gerber</i> ) 22. Topography of salivary glands. ( <i>Gallatz</i> )	Dissection of the face, neck, parotid region (cadaver and prosections)
<b>Week 12</b> 05.03-07.	23. Vessels of the head and neck region. Lymphatic drainage, cutaneous innervation. ( <i>Shahbazi</i> ) 24. Trigeminal nerve (CN 5) ( <i>Durst</i> )	Dissection of the infratemporal and pterygopalatine fossae/regions Orbit, macroscopy of cranial nerves (prosections)
<b>Week 13</b> 05.10-14.	25. Orbit, eye bulb. Extraocular muscles and eye movements. Oculomotor nerve (CN 3), trochlear nerve (CN 4), abducent nerve (CN 6). Facial nerve (CN 7) ( <i>Shahbazi</i> ) 26. Glossopharyngeal nerve (CN 9), vagus nerve (CN 10), accessory nerve (CN 11), hypoglossal nerve (CN 12) ( <i>Kozsurek</i> )	Dissection of the head and neck regions, branches of cranial nerves (cadaver)
<b>Week 14</b> 05.17-21.	27. Sympathetic and parasympathetic nervous systems ( <i>Tóth</i> ) 28. Innervation of the teeth and gingiva. Anatomical bases of dental anaesthesia ( <i>Gerber</i> )	Revision <b>Non-obligatory assessment:</b> Limbs and internal organs (except for the head and neck region)

# Macroscopic Anatomy II

## TOPICS OF THE FINAL EXAMINATION

### ***Musculoskeletal Anatomy***

General osteology, classification of bones

General arthrology

Components and classification of joints

General myology

Joints and muscles of the shoulder girdle.

Shoulder joint, movements and muscles.

Axilla, the quadrangular and triangular spaces

Muscle/fascial compartment of the arm (cross section)

Elbow joint, the gross anatomy of the muscles acting upon it. Cubital fossa

Muscle/fascial compartments of the forearm (cross section)

Movements and muscles of the radiocarpal joint

Osteofibrous spaces and muscle compartments of the hand, tendinous sheaths

Joints and muscles of the thumb and fingers

Composition of the pelvis (bones, ligaments and membranes)

External and internal muscles of the hip, supra- and infrapiriform hiatus

Hip joint and the muscles concerned with the movements

Osteofibrous compartments, muscles and cross section of the thigh

Knee joint and the muscles concerned with the movements. Popliteal fossa

Subinguinal hiatus, femoral trigone, adductor canal

Osteofibrous compartments, muscles and the cross section of the leg

Ankle joint, subtalar and talocalcaneonavicular joints together with the muscles acting upon them.

Structure of the foot, arches of the foot

Blood supply and innervation of the upper and lower limbs

Blood supply and innervation of the trunk

Brachial plexus, lumbar plexus, sacral plexus.

Dorsal branches of the spinal nerves, intercostal nerves

Structure of vertebrae

Structure of the vertebral column together with the muscles acting upon it

Back muscles

Joints, movements and muscles of the head&neck

Deep neck muscles (scalene and prevertebral muscles)

Muscles of the nape (suboccipital trigone)

Osteofibrous structure of the thoracic cage (bones, joints, ligaments, muscles, movements)

Diaphragm

Muscles and layers of the abdominal wall, rectus sheath

Inguinal canal, femoral canal

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)

### ***Circulatory system***

Shape, external features of heart

Chambers of heart

Endocardium, ostia, valves of heart

Skeleton of heart, anuli fibrosi

Structure of heart wall

Pulse 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

Pulmonary circulation

Ascending aorta, arch of aorta and its branches

Thoracic aorta and its branches

Abdominal aorta and its branches

Celiac 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

Cutaneous veins and lymphatic vessels of trunk

### ***Digestive system***

Tongue (parts, vessels, innervation)

Salivary glands (anatomy)

Isthmus of fauces

Palate, palatine muscles

Pharynx, (shape, position, parts, muscles)

Topography of the pharynx, para- and retropharyngeal spaces

Esophagus (anatomy)

Stomach (shape, position, parts)

Peritoneal relations of stomach

Blood supply and innervation of stomach

Duodenum (shape, position, divisions, vessels)

Jejunum-ileum (shape, position, vessels)

Rectum, anal canal (shape, position, vessels)

Liver (shape, position)

Gall bladder and biliary passages (anatomy)

Liver (peritoneal relations, vessels)

Circulation of liver, liver sinusoids

Pancreas (shape, position, vessels)

Peritoneum, greater and lesser omentum, mesentery, omental bursa



### ***Respiratory system***

Trachea and bronchial tree  
Lung (shape, parts, surfaces, hilum)  
Lung (position, topography, vessels, nerves)  
Surface projection of pleura and 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

### ***Urogenital system***

Kidney (shape, position, hilum, sinus, capsules)  
Kidney (section, vascular architecture)  
Renal pelvis and calyces  
Ureter  
Urinary bladder (shape, position, muscles, vessels)  
Female urethra  
Testis (shape, position, vessels)  
Epididymis, vas (ductus) deferens, spermatic cord  
Scrotum, coats of testis  
Seminal vesicle  
Prostate  
Male urethra, bulbourethral gland  
Penis (shape, position, mechanism of erection, vessels, nerves)  
Pelvic floor, male perineum  
Hernia canals (inguinal and femoral)  
Ovary (shape, position, vessels)  
Uterine tube (shape, position, vessels)  
Uterus (shape, parts, wall, cavity)  
Uterus (position, supporting structures, vessels)  
Broad ligament (lig. latum) and its components  
Vagina, female perineum  
External female genital organs (mons pubis, labia, vestibule of vagina, greater vestibular gland, vessels)

### ***Macroscopy of the nervous system***

Intracranial topography  
Dura mater, dural sinuses  
Arachnoid mater, pia mater, cisterns, CSF circulation  
Description of the spinal cord. Spinal nerves  
Meninges and blood supply of the spinal cord  
IV. ventricle

Medulla oblongata  
Pons, Midbrain  
Cerebellum  
Diencephalon (parts, blood supply). Thalamus, hypothalamus  
III. ventricle  
Telencephalon, blood supply. Hemispheres  
Basal ganglia  
Lateral ventricles  
Internal carotid artery (course, parts and branches)  
Vertebral artery (course and branches)  
Circle of Willis  
Veins of the brain  
Macroscopy of the cerebral cortex including the location of the most important centres  
Cranial nerves, brain, dural and skull exits  
Branches of cranial nerves (CN 3, CN 4, CN 5, CN 6, CN 7, CN 9, CN 10, CN 11, CN 12)  
General composition of the autonomic nervous system  
Sympathetic system (cranial, cervical, thoracic and lumbar parts)  
Sympathetic trunk  
Parasympathetic system (cranial and sacral parts)  
Extraocular muscles. Eye movements.  
Eyelids, conjunctiva, fasciae of the orbit, lacrimal apparatus

### **MAXILLOFACIAL ANATOMY**

Muscles of mastication  
Muscles of facial expression  
Superficial muscles of the neck, muscle triangles  
Deep muscles of the neck and the laminae of the cervical fascia  
Subclavian artery and its branches  
Common and external carotid arteries and their branches  
Maxillary artery and its branches  
Veins of face and neck  
Oral cavity (divisions, boundaries)  
Frontal section of the oral cavity  
Floor of mouth, sulcus lateralis linguae  
Types and morphology of teeth  
Blood supply and innervation of teeth  
Tonsils (anatomy)  
Faucial isthmus, palate  
Macroscopy of the tongue  
Salivary glands together with topography  
Pharynx and parapharyngeal spaces  
Blood supply and innervation of pharynx  
Pharyngeal muscles  
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

# ED Microscopic Anatomy and Embryology I. Announcements

## ***Subject matter of the semester***

### **Histology**

Microscopy of basic tissues

- epithelia, glandular tissues
- connective and supporting tissues
- types of muscle tissue
- histology of the corpuscular elements of blood, cells of the red bone marrow.

Microscopical structure of internal organs within the

- cardiovascular
- gastrointestinal
- respiratory
- urogenital systems
- embryology of maxillofacial structures: development of the face, derivatives of the pharyngeal arches/clefts/pouches, tooth development; histology of salivary glands and teeth

### **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, formation of the placenta, fetal membranes, fetal circulation.
- Organ development including the cardiovascular, digestive, respiratory, urogenital systems together with their malformations
- Histology and embryology of maxillofacial structures: development of the face, derivatives of the pharyngeal arches/clefts/pouches, tooth development

## ***Midterm test (obligatory)***

**Topics:** General embryology, general histology

**Date:** *Week 11, April 26*

*In case of absence, or an unsuccessful midterm result, students will have to attend a retake exam (TBA). The semester is only accepted if the midterm is successfully passed (with at least a mark 2).*

## ***Acceptance of the semester***

Active participation in histology laboratory sessions is obligatory. Students should attend at least 75% of the scheduled hours, and successfully pass (with at least a mark 2) the obligatory midterm test\*, to gain a signature proving the validity of the semester. Absences are therefore limited to 25%.

## ***Semifinal examination***

**The semifinal exam consists of** a written test (Histology and Embryology questions with photographs, images or schematic drawings)

**Topics:** Subject matter of the present semester: General and Organ/System based Histology and Embryology, including Maxillofacial Histology and Embryology

## Microscopic Anatomy I. Schedule

Week	Lectures <i>Monday 12.00-13.40 (Huzella lecture hall)</i>	Histology Laboratory <i>Monday 14.30-16.00</i>
<b>Week 1</b> 02.15-19.	1. Epithelial tissues, cell contacts, intercellular connections ( <i>Gerber</i> ) 2. Glandular epithelium ( <i>Puskár</i> )	Simple and stratified epithelia Glandular epithelium
<b>Week 2</b> 02.22-26.	3. Connective tissue cells and fibres. Extracellular matrix ( <i>Vereczki</i> ) 4. Blood. Corpuscular elements. Red bone marrow, erythropoiesis, Formation of leukocytes ( <i>Dóra</i> )	Connective tissue fibres and cell types Blood smear
<b>Week 3</b> 03.1-5.	5. Supporting tissues (cartilage, bone) ( <i>Puskár</i> ) 6. Ossification, bone remodelling ( <i>Gerber</i> )	Supporting tissues Types of bone formation
<b>Week 4</b> 03.8-12.	7. Muscle tissues, nervous tissues ( <i>Barna</i> ) 8. Histology of vessels ( <i>Nagy</i> )	Types of muscle tissues Histology of vessels Histology of the peripheral nervous system
<b>Week 5</b> 03.15-19	9. Histology of the tongue and airways ( <i>Hanics</i> ) 10. Histology of the esophagus and stomach ( <i>Vereczki</i> )	<b>March 15. National Holiday</b> <b>No histology class</b>
<b>Week 6</b> 03.22-26.	11. Gametes, fertilization, cleavage, blastulation ( <i>Székely</i> ) 12. Implantation. Molecular basis for gastrulation. Formation differentiation and derivatives of the germinal layers ( <i>Minkó</i> )	Histology of the gastrointestinal tract I Respiratory system
<b>Week 7</b> 03.29-04.02.	13. Microscopical anatomy of the small and large intestines ( <i>Barna</i> ) 14. Histology of the liver and pancreas ( <i>Tóth</i> )	Histology of the gastrointestinal tract II
<b>Week 8</b> 04.05-09.	15. Neurulation, folding of the embryo. Body axes, left-right lateralization, asymmetry ( <i>Vereczki</i> ) 16. Placenta, placental circulation, fetal membranes ( <i>Gerber</i> )	<b>Easter Monday</b> <b>No histology class</b>
<b>Week 9</b> 04.12-16.	17. Microscopical anatomy of urinary organs. Development of the urinary system ( <i>Ádám</i> ) 18. Histology of the male genital system ( <i>Dobolyi</i> )	Histology of the gastrointestinal tract III
<b>Week 10</b> 04.19-23.	19. Histology of the female genital system ( <i>Katz</i> ) 20. Development of the genital system ( <i>Adorján</i> )	Histology of the urinary system Placenta
<b>Week 11</b> 04.26-30.	21. Development of the heart. Fetal circulation ( <i>Kozsurek</i> ) 22. Development of arteries and veins ( <i>Csáki</i> )	<b>MIDTERM: Histology and Embryology</b> ---- Histology of the male genital system I.
<b>Week 12</b> 05.03-07.	23. Histology of the airways. Pharyngeal arches, development of the foregut, midgut and hindgut ( <i>Nagy</i> ) 24. Histology of teeth I. ( <i>Gallatz</i> )	Histology of the male genital system II.
<b>Week 13</b> 05.10-14.	25. Histology of teeth II. ( <i>Gerber</i> ) 26. Tooth development, malformations ( <i>Shahbazi</i> )	Histology of the female genital system
<b>Week 14</b> 05.17-21.	27. Development of the face, malformations ( <i>Gallatz</i> ) 28. Parodontal tissues ( <i>Gerber</i> )	Maxillofacial histology (structures of the oral cavity)

## ED I. Microscopic Anatomy I. List of slides

Week	<b>Digital histology slides</b> <i>Histology laboratory practices Mondays 14.30-16.00</i>
<b>Week 1</b> 02.15-19.	<p><b>Simple epithelial tissues</b></p> <p>50. Simple squamous epithelium (endothelium, elastic artery, HE)            2. <i>Simple cuboidal epithelium (kidney, HE)</i>      <i>Demonstration: 19. Umbilical cord (HE)</i>            3. <i>Simple columnar epithelium (gall bladder, HE)</i>            4. Pseudostratified simple columnar epithelium (epididymis, HE)</p> <p><b>Stratified epithelial tissues</b></p> <p><b>5. Stratified squamous nonkeratinized epithelium (esophagus, HE)</b>  <b>6. Stratified squamous keratinized epithelium (palmar skin, HE)</b>            7. Stratified columnar epithelium (penis, HE)            8. Transitional epithelium (urinary bladder, HE)</p> <p><b>Glandular epithelium</b></p> <p>10. Goblet cells (large intestine, HE)  <b>11. Holocrine secretion (sebaceous gland, hairy skin, HE)</b>            12. Apocrine secretion (prostate, HE)  <b>13. Merocrine secretion (submandibular gland, HE)</b></p>
<b>Week 2</b> 02.22-26.	<p><b>Connective tissue fibres</b></p> <p>14. Collagen fibres (tendon, HE)            15. Elastic fibers (large artery, RF)            16. Reticular fibers (liver, silver impregnation)  <b>17. Differentiation between epithelial and connective tissues (hairy skin, Azan)</b>  <b>18. Collagen and elastic fibres (hairy skin, Hornowsky)</b></p> <p><b>Connective tissue cells, types of connective tissue</b></p> <p>19. Embryonic connective tissue - mesenchyme (umbilical cord, HE)  <b>20. Connective tissue cells (scar tissue, HE)</b>      <i>Demonstration: 81. Cell rich connective tissue (uterus, HE)</i>            21. Mast cells (peritoneum, toluidine blue)      <i>46. Reticular connective tissue (spleen, HE)</i>            22. Fat cells – adipocytes (tongue, Sudan III.)  <b>52. Blood cells (blood smear – May-Grünwald-Giemsa)</b></p>
<b>Week 3</b> 03.1-5.	<p><b>Supporting tissues</b>      <b>Types of ossification, bone restructuring</b></p> <p><b>23. Hyalin cartilage (rib, HE)</b>      <b>28. Endochondral ossification (phalanx, HE)</b>            24. Elastic cartilage (epiglottis, RF)      <b>29. Intramembranous ossification (calvary, HE)</b>            25. Fibrous cartilage (meniscus, HE)            26. Bone – cross section (Schmorl)      27. Bone – longitudinal section (Schmorl)</p>
<b>Week 4</b> 03.8-12.	<p><b>Smooth, striated and cardiac muscle types</b></p> <p><b>30. Smooth muscle – cross and longitudinal sections (Jejunum, HE)</b>  <b>31. Striated muscle – longitudinal section (HE)</b>  <b>32. Striated muscle – cross section (HE)</b>  <b>34. Cardiac muscle - cross section (HE)</b>  <b>35. Cardiac muscle - longitudinal section, Purkinje-fibers (HE)</b></p> <p><b>Blood vessels</b></p> <p><b>50. Elastic artery (carotid artery, HE)</b>      <i>Demonstration : 15. Elastic artery (RF)</i>  <b>51 Medium-sized artery and vein (HE)</b>      <i>Demonstration: Muscular artery and vein (RF)</i>  <b>34. Arterioles, capillaries, venules, (cardiac muscle, HE)</b></p> <p><b>Peripheral nervous system</b></p> <p><b>36. Peripheral nerve – cross section (HE)</b>      <i>Demonstration : Peripheral nerve (OsO4); Periph nerves in skin (HE)</i>  <b>37. Pseudounipolar neurone (DRG, HE)</b>  <b>38. Multipolar neurones (autonomic ggl, AgNo3)</b>      <i>Demonstration: Myenteric plexus in the gut wall (HE)</i></p>
<b>Week 5</b> 03.15-19	<p><b>March 15 National Holiday - NO CLASS</b></p>

<p><b>Week 6</b> 03.22-26.</p>	<p><b>Gastrointestinal tract</b>  53. Lip (HE)  54. Filiform papillae (tongue, HE)  56. Circumvallate papillae (tongue, HE)    <i>Demonstration: ÁOK 50. Foliate papillae (tongue, HE)</i></p> <p><b>Respiratory tract</b>  71. Larynx, (HE)  72. Trachea (HE)  73. Lung (HE)                                    <i>Demonstration: ÁOK 61. Fetal lung (HE)</i></p> <p><b>Gastrointestinal tract</b>  5. Esophagus, HE  61. Esophago-gastric junction (cardia) (HE)</p>						
<p><b>Week 7</b> 03.29-04.02.</p>	<p><b>Gastrointestinal tract</b>  62. Stomach (fundus) (HE)  63. Stomach (fundus) (PAS-Congo-haematoxylin stain)  64. Pylorus (gastro-duodenal junction, HE)  65. Duodenum (HE)  30. Jejunum (HE)  66. Ileum (HE)  10. Colon (HE)  67. Appendix (vermiform appendix; HE)</p>						
<p><b>Week 8</b> 04.05-09.</p>	<p><b>EASTER MONDAY - NO CLASS</b></p>						
<p><b>Week 9</b> 04.12-16.</p>	<p><b>Gastrointestinal tract</b>  68. Liver (swine, AZAN)  69. Liver (human, HE)  16. Liver, (AgNO<sub>3</sub> impregnation)  3. Gall bladder (HE)  70. Pancreas (HE)</p>						
<p><b>Week 10</b> 04.19-23.</p>	<p><b>Urinary system and placenta</b>  2. Kidney (HE)  91. Ureter (HE)  8. Urinary bladder (HE)  19. Umbilical cord (HE)  3. Placenta (HE)</p>						
<p><b>Week 11</b> 04.26-30.</p>	<p><b>MIDTERM TEST (written) : Histology and Embryology</b></p> <p><b>Male genital system</b>  74. Testis (HE)</p>						
<p><b>Week 12</b> 05.03-07.</p>	<p><b>Male genital system</b>  12. Prostate gland (HE)  75. Spermatic cord (HE)  76. Seminal vesicle (HE)  7. Penis (HE)  77. Glans penis (HE)</p>						
<p><b>Week 13</b> 05.10-14.</p>	<p><b>Female genital system</b></p> <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">78. Ovary (H-E)</td> <td style="width: 50%;">81. Uterus, proliferation phase (HE)</td> </tr> <tr> <td>79. Ovary, corpus luteum (HE)</td> <td>82. Uterus, secretory phase (HE)</td> </tr> <tr> <td>80. Uterine tube (oviduct) (HE)</td> <td>84. Vagina (HE)</td> </tr> </table>	78. Ovary (H-E)	81. Uterus, proliferation phase (HE)	79. Ovary, corpus luteum (HE)	82. Uterus, secretory phase (HE)	80. Uterine tube (oviduct) (HE)	84. Vagina (HE)
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79. Ovary, corpus luteum (HE)	82. Uterus, secretory phase (HE)						
80. Uterine tube (oviduct) (HE)	84. Vagina (HE)						
<p><b>Week 14</b> 05.17-21.</p>	<p><b>Tooth development, salivary glands, stology of the oral cavity</b>  57. Developing tooth (AZAN)                                    <i>Demonstration: ÁOK 54 a, b. Ground tooth (unstained)</i>  58. Parotid gland (HE)  13. Submandibular gland (HE)  60. Submandibular gland (haematoxylin and mucicarmin stain)  59. Sublingual gland (HE)</p>						

# ED I Microscopic Anatomy 1

## Topic list for the semifinal examination

### **General Histology**

Concept of basic tissues  
Definition and classification of epithelial tissue  
Simple epithelia  
Stratified epithelia  
Glandular epithelia  
Pigment epithelium, sensory neuroepithelium  
Cells of connective tissue  
Ground substance and fibres of connective tissue  
Types of connective tissue  
Blood and the corpuscular elements of blood  
Histology of the bone marrow, maturation of erythrocytes and platelets  
Differentiation of granulocytes, lymphocytes and monocytes  
Histology of cartilage and bone tissue  
Intramembranous ossification. Endochondral ossification. Growth and remodeling of bone  
Smooth muscle and myoepithelial cells  
Skeletal muscle tissue  
Cardiac muscle tissue  
Histology of arteries and arterioles  
Histology of veins and capillaries

### **Histology of organs**

Wall structure of hollow organs  
General composition of parenchymal (solid/compact) organs  
Histology of the lip and tongue  
Histology of the respiratory tract. Larynx. Trachea. Lung  
Histology of the esophagus and stomach  
Histology of the small and large intestines. Fine structure of the intestinal villi, enteroendocrine system  
Histology of the liver. Gall bladder, biliary ducts  
Histology of the pancreas  
Histology of kidney. Ureter. Urinary bladder  
Histology of the male and female gonads and genital organs/ducts  
Histology of the uterus (proliferative, secretory phases) menstrual cycle, vagina

### **General Embryology**

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

Formation of body axes  
Formation of the intraembryonic mesoderm; the notochord  
Neurulation (neural tube and neural crest)  
Derivatives of ectoderm  
Derivatives endoderm  
Differentiation of the intraembryonic mesoderm  
Folding of the embryo  
Development of the primitive cardiovascular system  
The structure and function of the placenta  
Development of the fetal membranes (chorion and amnion) and the umbilical cord

### ***Development of internal organs***

Development of the heart, looping of the heart tube  
Formation of atria, development of the interatrial septum  
Formation of ventricles, development of the aorticopulmonary septum  
Development of arteries  
Development of the inferior vena cava  
Development of the portal vein  
Development of the superior vena cava, azygos and hemiazygos veins  
Fetal circulation  
Development and differentiation of the midgut  
Development and differentiation of the hindgut  
Formation of the liver and pancreas  
Development of the lower airways including the lungs  
Kidney development  
Development of the urinary passages  
Gonadal development  
Development of the male genital tract  
Development of the female genital tract  
Development of the male/female external genitals  
Development and divisioning of the body cavities  
Development of the peritoneum

### ***Maxillofacial Histology and Embryology***

Enamel; Amelogenesis  
Dentin; Dentinogenesis  
Structure of the dental papilla  
Cementum (two types)  
Parodontium  
Gingiva – subdivisions and histology  
Tooth development  
Tooth eruption  
Development of the mandible and maxilla  
Development of the face. Formation of the nasal cavity and paranasal sinuses  
Microscopic Anatomy and development of the primary and secondary palates  
Microscopic Anatomy and development of the tongue  
Microscopic Anatomy and development of salivary glands  
Derivatives of pharyngeal pouches and grooves  
Derivatives of pharyngeal arches



# RECOMMENDED BOOKS

## List of textbooks

- **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**
- **Human Anatomy, Color Atlas and Textbook, 6th Edition by J Gosling, P Harris, J Humpherson, I Whitmore and P Willan; ISBN 9780723438274 Elsevier, 2016.**
- **Fitzgerald's Clinical Neuroanatomy and Neuroscience, 7th Edition, Elsevier, 2015.**
- **Oral Anatomy, Histology and Embryology, 4<sup>th</sup> Edition, by B. Berkovitz Paperback with STUDENT CONSULT Online Access and e-book ISBN: 9780723434115 Copyright: 2009**
- **McMinn's Color Atlas of Head and Neck Anatomy, by Logan, Reynolds, Rice & Hutchings, 5th Edition, Elsevier 2016**
- **Functional Anatomy Anatomy, Histology and Embryology for medical and dental students by M. Réthelyi and J. Szentágothai, Medicina, 2018.**
  
- *Illustrated Dental Embryology, Histology, and Anatomy, 3<sup>rd</sup> Edition by Mary Bath-Balogh ISBN: 9781437717303, 2011.*
- *Netter's Head and Neck Anatomy for Dentistry, 3rd Edition, Elsevier, 2016.*
- *Anatomy, A Photographic Atlas, 8th Edition by Rohen, Yokochi; Wolters Kluwer, 2016, ISBN: 978-1-4963-0870-2*
- *Bräuer: Sobotta Flashcards (Muscles; Bones, Ligaments, and Joints) URBFI, 2013.*
- *KL Moore–AF Dalley: Clinically Oriented Anatomy. 4th ed. Lippincott William and Wilkins, 1999*
  
- **The Developing Human – Clinically Oriented Embryology, 10th ed. by KL Moore, TVN Persaud and M Torchia, Saunders, 2015; ISBN 9780323313384**
- **Histology: A Text and Atlas: With Correlated Cell and Molecular Biology; 7th Edition by MH Ross and W Pawlina ; Wolters Kluwer 2015, ISBN 9781451187427**
- **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**
- **Oral Anatomy, Histology and Embryology, 4<sup>th</sup> Edition, by B. Berkovitz Paperback with STUDENT CONSULT Online Access and e-book ISBN: 9780723434115 Copyright: 2009**
- **Functional Anatomy, Histology and Embryology for medical and dental students by M. Réthelyi and J. Szentágothai, Medicina, 2018.**
  
- *Langmann's Medical Embryology, 13th Edition by TW Sadler, Wolters Kluwer, ISBN 9781469897806, 2014*
- *Junqueira's Basic Histology: Text and Atlas; 13th Edition by Anthony Mescher, New York, McGraw-Hill Medical, 01/03/2013 ISBN13 978007178033*
- *Wheater's Functional Histology, A Text and Colour Atlas, 6<sup>th</sup> Edition by B Young, G O'Dowd and P Woodford ISBN 9780702047473, Churchill Livingstone, Edinburgh, 2013.*
- *Illustrated Dental Embryology, Histology, and Anatomy, 3<sup>rd</sup> Edition by Mary Bath-Balogh ISBN: 9781437717303, 2011.*

**Further study aids:** To be downloaded from the homepage of the Department of Anatomy, Histology and Embryology (<http://semmelweis.hu/anatomia>) or from Knowledgebase on the Library homepage: ([https://lib.semmelweis.hu/knowledge\\_base](https://lib.semmelweis.hu/knowledge_base)).