

Semmelweis University
Department of Anatomy, Histology and Embryology

Faculty of Dentistry
1st year, 2nd semester

ANATOMY HANDBOOK



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Anatomy, Histology and Embryology for ED students

TEACHING DEPARTMENT:

SEMMELWEIS UNIVERSITY

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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: 27 (first semester: 8; second semester: 7; third semester: 7; fourth semester: 5)

ED I
Announcements

Signing of the lecture book: active participation in lectures, 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%**.

Midterm examinations: The **anatomy** midterms include both identification of several structures on the specimen and theoretical questions related to the subject. The **histology** midterms include the identification of a certain number of structures in slides, as well as, theoretical questions related to the subject. The results of all tests will appear on the personal achievement cards.

Semifinal examinations consist of practical and theoretical parts

Practical examination - exemption: Every student passing both dissection room midterms will be exempted from a semifinal practical examination. The dissection mark, calculated from the midterm marks (2.0 - 2.49: **2**; 2.5 - 3.49: **3**; 3.5 - 4.49: 4 and 4.5 - 5: **5**), will be written on the personal achievement cards. Midterm failures cannot be retaken. Students, unhappy with their dissection mark, may apply in writing for a practical examination, before the end of the 13th study week, with the Course Director. These students will start their semifinal examination in the dissection room prior to the theoretical part. (***NB: when opting for a semifinal practical examination, you will lose the exemption and also may fail the examination during the practical part***)

Theoretical semifinal examination - composed of oral theoretical questions and the identification/description of one histological specimen.

Notebooks should be regularly used in **histology lab sessions** in order to prepare schematic drawings of the histological specimens. Students will be asked to present their histology notebooks, containing the drawings, during the semifinal or final exams.

*N.B. – In case, when neither the first nor the repeated takes of a semifinal exam have been successful during the summer examination period, the students may register for a CV course and sit for an exam in the following winter examination period, but they cannot continue with their studies because a **successful ANA2 semifinal exam is the prerequisite of registering for the following ANA3 semester**. Those, who opt for a regular course, will have to again register for ANA2 in the 2nd semester of the following academic year (2017/2018).*

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, or videos can only be made with the agreement and 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!**

ED I.

Subject matter of the 2nd semester

I. Morphology, histology and development of the cardiovascular system

Heart and its associated structures (vessels and pericardium)

Vessels in general

Pulmonary circulation

Systemic circulation (subclavian, axillary, external carotid arteries, thoracic and abdominal aortae, branches of the external and internal iliac arteries, superior and inferior venae cavae, together with the tributaries of the hepatic portal vein)

Fetal circulation

Lymphatic system

II. Gastrointestinal tract Morphology, histology and development of internal organs

Respiratory system

Urogenital apparatus

Serous membranes (pleura and peritoneum)

Pelvic floor, perineum

Test I.

Topic: Heart, great vessels, development, fetal circulation

Date: 4th study week, February 22

Test II.

Topic: Histology of the cardiovascular system, lymphatic organs, respiratory and the gastrointestinal tracts

Date: 8th study week, March 24.

Test III.

Topic: Anatomy and development of the gastrointestinal and respiratory systems, cross sections of the abdomen and thorax

Date: 11th study week, April 19

Semifinal examination

Topic: Subject matter of the semester

1. Dissection room test (for those whose midterm average /presence is not sufficient)
2. Histology of the internal organs (slide).
3. Theoretical questions (oral examination)

N.B.: The following topics will be discussed later and DO NOT FORM PART OF THIS SEMESTER
Anatomy, histology and the development of teeth, branches of the maxillary artery, development of lesser veins (BUT, the development of the inferior and superior venae cavae, together with the development of the portal vein is a must)

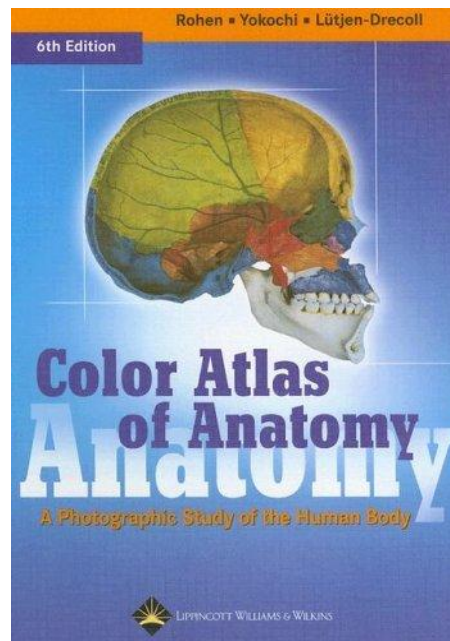
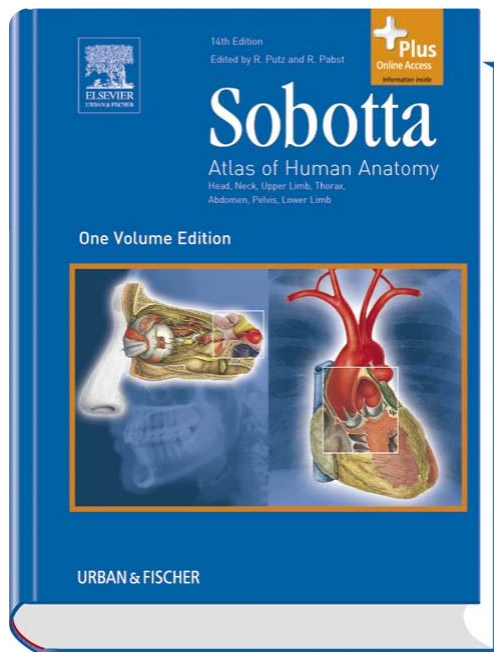
ED I. Academic year 2016/2017 Second Semester

Week	Lectures <i>Wed 13.20 - 15.00 Fri 11.00-11.45</i>	Practical sessions	
		Dissection room <i>Wed 15.15-16.45</i>	Histology lab <i>Fri 12.00-13.30</i>
Week 1 Jan. 30 - Febr. 3.	1. Circulatory system, composition, significance. Histology of the vessels 2. Lymphatic organs 1- lymph node, tonsils 3. Lymphatic organs 2 - spleen, thymus	Dissection of heart, visceral complex	Vessels: arteries, veins, arterioles, venules, capillaries. Lymphatic organs: tonsils
Week 2. Febr. 6-10.	4. Chambers of the heart, external features 5. Structure of heart wall, myocardium, valves, anuli fibrosi 6. Vessels, innervation, conducting system, surface projection of the heart, pericardium	Dissection of heart, visceral complex	Lymphatic organs: spleen, thymus
Week 3. Febr. 13-17.	7. <i>Development of the heart (Film)</i> 8. <i>Development of the arteries and veins; malformations</i> 9. Gastrointestinal tract. Fine structure of the hollow and parenchymal viscera	Dissection of heart, visceral complex	Oral cavity: lip, filiform, fungiform vallate papillae, radix linguae
Week 4. Febr. 20-24.	10. Morphology and histology of the oral cavity, soft palate and the faucial isthmus 11. <i>Development of the face (film)</i> 12. Morphology and histology of the tongue and salivary glands	Test I: Heart, great vessels, heart and vessels' development, fetal circulation	Ground teeth, tooth bud. Parotid, submandibular, sublingual glands
Week 5. Febr. 27- March 3.	13. <i>Development of the pharyngeal pouches and the tongue</i> 14. Pharynx and parapharyngeal spaces 15. Morphology and histology of the esophagus, the stomach, the small intestine and pancreas	Dissection: cervical viscera, vessels and nerves, branches of the aorta	Gastrointestinal tract: Oesophagus, cardia, fundus, pylorus of the stomach, duodenum, jejunum
Week 6. March 6-10.	16. Morphology and histology of the large intestine and rectum 17. Morphology and histology of the liver and biliary system. Portal vein 18. - - - Break between 11.00-13.00	Dissection: cervical viscera, vessels and nerves, branches of the aorta	Break between 11.00-13.00 (optional class)
Week 7. March 13-17.	19. - March 15th is a National Holiday 20. - March 15th is a National Holiday 21. <i>Development of the fore-, mid- and hindgut</i>	NO DISSECTION CLASS March 15th is a National Holiday	GI tract: Ileum, colon, vermiform appendix liver, gall bladder, pancreas
Week 8. March 20-24.	22. Peritoneum, cross sections, abdominal cavity 23. <i>Development of serous membranes, separation of body cavities</i> 24. Morphology of the nasal cavity and paranasal sinuses	Demonstration of peritoneum, dissection of abdominal organs, vessels Dissection: visceral complex (abdominal organs, vessels)	Test II: Vessels, heart, lymphatic organs, respiratory and gastrointestinal tracts
Week 9. March 27-31.	25. Larynx, cartilages, joints, muscles 26. Larynx, connective tissue skeleton, mucous membrane 27. Morphology of the trachea and lung, pleura. Mediastinum, cross sections	Demonstration of thoracic and abdominal situs on embalmed cadavers	Respiratory system: larynx, trachea, lung.
Week 10. April 3-7.	28. Histology and development of the respiratory system 29. Morphology and histology of the kidney 30. Morphology and histology of the urinary passages, pelvis, ureter, and bladder	Demonstration of thoracic and abdominal situs on embalmed cadavers	Urinary system kidney, ureter, urinary bladder
Easter break			
Week 11. April 17-21.	31. <i>Development of the uropoietic apparatus</i> 32. Morphology of the testicle. Spermiogenesis Coats of the testicles. Hernia canals. 33. Morphology and histology of the epididymis, spermatic cord and the seminal vesicle and prostate	Test III: Anatomy & embryology of the gastrointestinal & respiratory systems, cross sections of the thorax and abdomen	Male genitals: testis, epididymis, spermatic cord, seminal vesicle, prostate
Week 12. April 24-28.	34. - - - Faculty Day 35. - - - Faculty Day 36. Morphology and histology of penis and male urethra.	Faculty Day (competition)	Penis, Glans Female genitals: Ovary, Corpus uteum
Week 13. May 2-5 <i>competition 1st round</i>	37. Morphology and histology of the ovary and the uterine tube. Oogenesis. 38. Morphology and histology of the uterus, divisions and content of the broad ligament 39. Morphology and histology of the vagina and the external genital organs	Dissection of the abdominal and pelvic visceral complexes, male and female genital organs Retroperitoneum, kidney, ureter, suprarenal gland, pancreas, vessels Demonstration of pelvic situs.	Uterine tube, uterus (proliferation, secretion), vagina
Week 14. May 8-12 <i>competition 2nd round</i>	40. The pelvic and urogenital diaphragms (male, female) 41. Cross sections of the male and female pelvis 42. <i>Development and malformations of the genital system, hermaphroditism.</i>	Test: urogenital apparatus, pelvic floor, perineum, hernia canals	Revision

ED I Histological specimens 2016/2017 2nd semester

Week	Slides
Week 1 Jan. 30 -Febr. 3.	<p>Vessels 50. Elastic artery (carotid artery, H-E) Demonstration : 15. Elastic artery (R-F) 51 Medium-sized artery and vein (H-E) 55. Arterioles, capillaries, venules (Fungiform papilla - H-E) Demonstration: Muscular artery and vein (R-F)</p> <p>Lymphatic organs 47. Palatine tonsil (H-E) 48. Lingual tonsil (H-E) Demonstration: Pharyngeal tonsil (H-E)</p>
Week 2. Febr. 6-10.	<p>44 Lymph node (H-E) Demonstration: Lymph node (Ag-impr.) 45. Spleen (H-E) 46. Spleen -white pulp (perfused preparation, H-E 49. Thymus (H-E) Demonstration: Thymus adiposus (H-E)</p>
Week 3. Febr. 13-17.	<p>Gastro-intestinal organs 53. Lip (H-E) 54. Filiform papillae (tongue, H-E) 55. Fungiform papillae and small vessels (tongue, H-E) 56. Circumvallate papillae (tongue, H-E) - Demonstration: Foliate papilla (H-E) 48. Root of the tongue (lingual tonsil (H-E)</p>
Week 4. Febr. 20-24.	<p>57. Developing tooth (Azan stain) - Demonstration: Tooth (native) 58. Parotid gland (H-E) 13. Submandibular gland, H-E 60. Submandibular gland (haematoxylin and mucicarmin stain) 59. Sublingual gland (H-E)</p>
Week 5. Febr. 27- March 3.	<p>5. Esophagus, H-E 61. Esophago-gastric junction (cardia) (H-E) 62. Stomach (fundus) (H-E) 63. Stomach (fundus) (PAS-Congo-haematoxylin stain) 64. Pylorus (gastro-duodenal junction).(H-E) 65. Duodenum (H-E) 30. Jejunum (H-E)</p>
Week 6. March 6-10.	Break between 11.00-13.00 (optional class)
Week 7. March 13-17.	<p>66. Ileum (H-E) 10. Colon (H-E) 67. Appendix (vermiform appendix; H-E) 68. Liver (Azan stain) 69. Liver (human, H-E) 16. Liver, (silver nitrate impregnation) - Demonstration: Liver (ink injected) 3. Gall bladder (HE) 70. Pancreas (H-E)</p>
Week 8. March 20-24.	Test II.: vessels, lymphatic organs, respiratory and digestive systems
Week 9. March 27-31.	<p>71. Larynx (H-E) 72. Trachea (H-E) 73. Lung (H-E) Demonstration: Lung (R-F); Fetal lung (H-E)</p>
Week 10. April 3-7.	<p>Uropoetic organs 2. Kidney (H-E) - Demonstration: kidney (Tri-PAS) 91. Ureter (H-E) 8. Urinary bladder, H-E</p>
April 10-14	Easter break
Week 11. April 17-21.	<p>Male genital organs 74. Testis (H-E) 4. Epididymis (H-E) 75. Spermatic cord (H-E) 76. Seminal vesicle 12. Prostate gland (H-E)</p>
Week 12. April 24-28.	<p>Female genital organs 7. Penis (H-E) 77. Glans penis (H-E) 78. Ovary (H-E) 79. Ovary, corpus luteum (H-E)</p>
Week 13. May 2-5	<p>80. Uterine tube (oviduct) (H-E) 81. Uterus, proliferation phase (H-E) 82. Uterus, secretory phase (H-E) 84. Vagina (H-E)</p>
Week 14. May 8-12	Revision

RECOMMENDED BOOKS



ED I Second semester

TOPICS OF THE SEMIFINAL EXAM

Circulatory system

Shape, external features of heart
Chambers of heart, endocardium, orifices, valves
Skeleton of heart, anuli fibrosi
Structure and histology of heart wall, myocardium, cardiac muscle
Conducting system
Pericardium
Position and surface projections of heart
Radiology of heart
Development of heart tube
Division of atria (septum primum and secundum, foramen ovale)
Development of ventricles (interventricular septum)
Ascending aorta, arch of aorta and its branches
Branches of the common and external carotid arteries
Subclavian artery (+ branches)
Thoracic aorta (+branches)
Celiac trunk (+ branches)
Superior mesenteric artery (+ branches)
Inferior mesenteric artery (+ branches)
Branches of the internal iliac artery
Superior vena cava and its tributaries
Inferior vena cava and its tributaries
Azygos and hemiazygos veins
Portal vein, portocaval anastomoses
Histology of arteries, arterioles and capillaries
Development of aorta and branchial (pharyngeal) arch arteries
Development of great veins (caval, portal, azygos)
Fetal circulation
Histology of venules, veins and lymphatic vessels

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)
Histology of lymph nodes

Digestive system

Oral cavity (divisions, boundaries)
Floor of mouth, sulcus lateralis & medialis linguae
Tongue (parts, vessels, innervation, histology)
Salivary glands (anatomy, histology)
Isthmus of fauces
Hard and soft palates, palatine muscles
Pharynx, (shape, position, parts, muscles)
Topography of the pharynx, para and retropharyngeal spaces
Oesophagus (anatomy, histology, embryology)
Derivatives of foregut (pharynx, oesophagus, stomach, duodenum)
Stomach (shape, position, parts)
Peritoneal relations of stomach
Blood supply and innervation of stomach
Histology of stomach
Duodenum (shape, position, divisions, vessels)
Divisions and histology of small intestine
Fine structure of the intestinal villi
Large intestine (shape, position, divisions, vessels and histology)
Histology of vermiform appendix
Rectum, anal canal (shape, position, vessels)
Liver (shape, position, vessels, peritoneal relations, development and histology)
Gall bladder and biliary passages (anatomy, histology, embryology)
Circulation of liver, liver sinusoids
Histology of gall bladder and extrahepatic biliary tracts
Pancreas (shape, position, development, histology and vessels)
Peritoneum, greater omentum, lesser omentum, mesentery, omental bursa
Derivatives of midgut, physiological umbilical hernia
Development of hindgut
Development and separation of body cavities
Development of the peritoneum
Development of diaphragm

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
Histology and development of the larynx
Trachea and bronchial tree (anatomy, histology and development)
Lung (shape, parts, surfaces, hilum, position, vessels, nerves)
Pleura, pleural cavity
Surface projection of pleura and lung
Histology and development of the lung

Urogenital system

Kidney (shape, position, hilum, sinus, capsules and vessels)
Histology of kidney (+JGA)
Development of kidney (pronephros, mesonephros, metanephros)
Calyces, renal pelvis and ureter (anatomy, histology and embryology)
Urinary bladder (shape, position, muscles, vessels)
Histology and development of the urinary passages
Differentiation of the urogenital sinus
Female urethra (anatomy, histology and embryology)
Testis (shape, position, vessels)
Histology and development of testis, spermatogenesis
Epididymis, vas 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)
Histology of penis and male urethra
Pelvic floor, male perineum
Hernia canals (inguinal, femoral)
Development of the male external genital organs
Ovary (shape, position, vessels and development)
Histology of ovary, oogenesis and the corpus luteum
Uterine tube (shape, position, vessels; histology, embryology)
Uterus (shape, parts, wall, cavity, position, supporting structures, vessels)
Broad ligament (divisions and content)
Histology of uterus, menstrual cycle
Vagina, female perineum
External female genital organs (mons pubis, labia, vestibule of vagina, greater vestibular gland, vascular supply)
Development of female genital tracts
Histology of vagina
Development of the female external genital organs