HISTOLOGY AND EMBRYOLOGY	
GENERAL INFORMATION	
Course coordinator	Professor Tatjana Belovari, MD, PhD
Assistant/Associate	Associate Professor Biljana Pauzar, MD, PhD Assistant Professor Nikola Bijelić, PhD Edi Rođak, MBio
Study Programme	Integrated undergraduate and graduate university study of Medicine
Status of the course	Mandatory
Year of study, semester	2nd year, 4th semester
ECTS	**9**
Workload (hours)	Lectures (35); Seminars (40); Exercises (65)
Expected number of students	70
COURSE DESCRIPTION	
Course objectives	
Histology: Acquiring knowledge about the normal structure of human body on light microscopy and electron microscopy level, about cytomorphological and histomorphological properties of cells and tissues and their organization into organs and organ systems. Acquiring skills in microscopic examination of histologic preparations and differentiating between organs and tissues based on histologic properties. Understanding microscopic structure enables understanding the relation of structure and function of different organs and creates a basis for understanding the pathomorphological changes in the etiopathogenesis of diseases. Embryology: Acquiring knowledge about the development of human embryo from fertilization to the end of intrauterine development, which enables understanding of the complex structural relations in the human body and the anomalies during organ development. The acquired knowledge helps to understand the clinical medical disciplines such as gynaecology, obstetrics, paediatrics, and corrective surgery.	
Enrolment requirements and entry competencies	
Knowledge of biology, chemistry and physics, anatomy exam passed.	
Learning outcomes at the Programme level	
1.1., 2.1., 3.1., 4.2.	
Learning outcomes (5-10 outcomes)	
After completing lectures, seminars and exercises, individual learning and passing the exam, the students will be able to: 1. Choose the appropriate procedure for making histologic preparations regarding the required morphological analysis of the tissues and organs 2. Critically evaluate the quality of a histologic preparation and possible issues with the interpretation of a histologic preparation 3. Interpret histologic preparations of tissues and organs based on the properties of cells and extracellular matrix, their arrangement, and spatial relations 4. Make conclusions about the functions of cells and tissues based on their histomorphological properties 5. Estimate the impact of cell and tissue properties and embryonic development on the	

occurrence of diseases and conditions
6. Estimate the importance of different events during gametogenesis, fertilization, cleavage, and implantation for the embryo development.
7. Critically evaluate the impact of genetic and environmental factors on embryonic and foetal development of human embryo
8. Demonstrate the relationship between embryonic development of organs and organ systems with normal anatomy and development of congenital anomalies
9. Judge about the importance of embryonic membranes during prenatal development and birth

Course content

Lectures

Introduction into histology. Histology methods. Basic tissue types. Organization of epithelial tissue. Connective tissue. Cartilage and bone. Muscle tissue. Nervous tissue. The circulatory system. Blood cells and hemopoiesis. Immune system. Neuroendocrine system. Introduction into embryology. Reproductive system. Menstrual and ovarian cycle. Fertilization and implantation. Embryonic development. Embryonic membranes. Teratogenic factors and congenital malformations. Skin. The digestive system. Development of the gastrointestinal tract. Development and structure of liver and pancreas. Development and structure of the respiratory system. Development of the urinary system. Development of the reproductive system. Development of the skeleton, face formation. Development of the eye and the ear. Development of the circulatory system.

Seminars

Epithelial tissue. Cells and extracellular matrix of the connective tissue. Cells and extracellular matrix of cartilage and bone. Ossification. Muscle tissue. Neurons, neuroglia, blood-brain barrier. Blood vessels, blood cells. General histology knowledge repetition. Lymphoid organs. General histology knowledge evaluation. Endocrine glands. Female reproductive system. Male reproductive system. Placenta. First and second week of development. Ectoderm, mesoderm, and endoderm derivates. Skin and its derivates. Oral cavity. Embryonic and foetal development. Tooth structure and development. Regional characteristics of gastrointestinal tract. Structure and function of liver and pancreas. Respiratory system. Urinary system. Development of reproductive glands, ducts, and external reproductive organs. Development of skeletal and muscular system. The eye and the ear. Knowledge repetition. Special histology knowledge evaluation. Development of the heart and blood vessels.

Exercises

Sample preparation for histological analysis. Staining methods. Lining and secretory epithelium. Irregular connective tissue, tendon. Hyaline, elastic and connective cartilage, decalcified bone. Intramembranous and endochondral ossification. Skeletal, cardiac, and smooth muscle. Cerebrum, cerebellum, spinal cord. Sensory and autonomic ganglion, peripheral nerve. Heart valve, artery and vein, blood. Repetition of general histology preparations. Lymph node, spleen, thymus, palatine tonsil, pharyngeal tonsil. Pituitary gland, thyroid gland, parathyroid glands, adrenal gland. Ovary, Fallopian tube, uterus, vagina. Testis and epididymis, vas deferens, penis, prostate, seminal vesicles. Placenta and umbilical cord. Skin of the scalp, mammary gland. The lip, parotid, and submandibular gland. Tongue. Tooth in alveolus, tooth development. Oesophagus, stomach:

fundus and pylorus. Small and large intestine, appendix. Liver and pancreas. Palate, trachea, and lungs. Kidney, ureter, and urinary bladder. Repetition of reproductive system preparations. The eye. The ear. Repetition of special histology preparations.

Mode of teaching

Lectures; Seminars; Laboratory exercises

Student obligations

All types of classes and all knowledge tests are mandatory. Justified absence from 30% of classes is allowed. Missed exercise must be made up for.

Monitoring student work *(Connectivity of learning outcomes, teaching methods and grading)*

Teaching activity	ECTS	Learning outcome	Student activity	Assessment methods	Grade points	
					Min.	Max.
Attending classes	0.8	1-9	Attendance at classes (L, S, E)	Keeping records	5	9
Seminars Exercises	1.3	1-9 1-5, 8	Attendance and active participation in seminars and exercises	Keeping records of seminar activity and exercise logs	8	14
Knowledge tests (partial tests or the whole written exam)	2.9	1-9	Studying for partial knowledge tests or whole written part of the test	Partial tests H1 and H2	16	32
Final exam	4	1-9	Studying for the final exam	Written part* Practical part Oral part	 7 14	 15 30
Total	**9**				**50**	**100**

* Students who didn't pass H1 and H2 during the classes.

Calculation of final grade:

Final exam

The student needs to meet the minimal criteria for each part (written, practical, oral) to qualify for passing the final exam.

Written part of the exam consists of general histology test (H1, 50 questions) and special histology test (H2, 50 questions). Students who don't pass the partial written knowledge tests (H1 and H2) during the classes will take them during the final exam. Students who take both partial tests during the final exam will take them together, and each of them will

be evaluated separately. Passed written part of the exam is valid for 12 months.

Evaluation of the partial tests and the written part of the final exam:

Percentage of correct answers (%)	Grading points
60.00-64.99	8
65.00-69.99	10
70.00-74.99	11
75.00-79.99	12
80.00-84.99	13
85.00-89.99	14
90.00-94.99	15
95.00-100.00	16

Practical part of the exam. The student receives 6 histological preparations which need to be independently analysed using a microscope, the correct tissue or organ must be determined, and its structure needs to be described. If the student determines two (2) preparations incorrectly, he/she cannot be positively evaluated during the practical part of the exam, as well as the final exam.

Evaluation of the practical part of the exam:
7 grading points: all preparations determined correctly, the knowledge meets the minimal criteria, or, one preparation determined incorrectly, and average knowledge demonstrated for others
10 grading points: all preparations determined correctly, average knowledge with noticeable mistakes demonstrated, or, one preparation determined incorrectly, and very good or excellent knowledge demonstrated for others
13 grading points: all preparations determined correctly, very good knowledge with minor mistakes demonstrated
15 grading points: all preparations determined correctly, excellent knowledge

Oral part of the exam consists of six (6) questions for embryology: 2 questions for general embryology and 4 questions for special embryology. The student “pulls” the question cards by himself/herself.

Evaluation of the oral part of the exam:
14-18 grading points: the knowledge meets the minimal criteria
19-23 grading points: average knowledge with noticeable mistake
24-27 grading points: very good knowledge with minor mistakes
28-30 grading points: excellent knowledge

Forming the final grade:
The points granted for the final exam are added to the grade points awarded during class attendance. The grading process is conducted by absolute distribution, i.e., based on total achievements, and compared to the numerical system in the following manner:
A – Excellent (5): 80-100 grade points; B – Very Good (4): 70-79.99 grade points; C – Good (3): 60-69.99 grade points; D – sufficient (2): 50-59.99 grade points

Mandatory literature (available in the library and via other media)

Title	Number of copies in the library	Availability through other media
1. Junqueira LC, Carneiro J: Osnove histologije, udžbenik i atlas prema 10. američkom izdanju. Školska knjiga, Zagreb, 2005.	10	90 (student registry estimate)
2. Sadler TW: Langmanova medicinske embriologija, 10. izdanje. Školska knjiga, Zagreb, 2008.	25	90 (student registry estimate)
3. Durst-Živković B: Praktikum iz histologije, V. prerađeno izdanje, Školska knjiga, Zagreb, 2007	5	90 (student registry estimate)

Additional literature

1. Sobotta J, Welsh U: Histološki atlas, Naklada slap, Zagreb, 2004.
2. Mescher, AL: Junqueira's Basic Histology: Text and Atlas. 16th edition. New York: McGraw-Hill Education, 2021.
3. Online histology atlas. https://histologyguide.com/

Quality assurance procedures designed to ensure the acquisition of outcomes and competencies

Anonymous, quantitative, standardised student survey on the course and the teacher's work implemented by the Quality improvement office of the Faculty of Food Technology Osijek and the Faculty of Medicine Osijek.

Note/Other

E-learning is not included in the class quota, but it is used in teaching, and it contains links to various sites and video and audio materials available on websites.