

Faculty of Medicine, University of Rijeka

Course: Histology and Embryology

Course Coordinator: Ester Pernjak Pugel, MD, PhD, Full Professor

Department: Department of Histology and Embryology

Study: Integrated Undergraduate and Graduate University Study of Medicine in English

Year of the study: Second

Academic year: 2021/2022

COURSE SYLLABUS

Course information (basic description, general information, teaching overview, required equipment, and preparation, etc.)

Histology and Embryology is a compulsory course at the second year of the Integrated Undergraduate and Graduate University Study of Medicine in English. It consists of 32 hours of lectures, 44 hours of seminars, and 44 hours of laboratory practicals, overall 120 hours (10 ECTS). Lectures are held in lecture halls of the Faculty of Medicine according to the course schedule. Seminars and laboratory practicals are held at the Department of Histology and Embryology.

Course objectives

Histology is one of the basic fields of medicine, which deals with the structure of a human body that can be studied using the light microscope or related devices. Histology also deals with the cell morphology (cytology) and with the fine structure of some organs (microscopic anatomy). Histology encompasses the entire microscopic and submicroscopic structure of an organism. Embryology studies the development of the embryo and helps students understand the complex relationship within the structure of the human body. Emphasis is on the morphogenesis during the organogenesis and on understanding the molecular and cellular basis of differentiation. Its practical medical implications are also of great importance since it accounts for the appearance of anomalies in the development of certain organs. Relationships between congenital malformations and errors in embryological development are discussed.

Expected course learning outcomes

At the end of this course, students will be able to demonstrate a working knowledge of human histology, development, correlate structure, and function of the human body. Students should be able to comprehend the molecular, biochemical, and cellular events that regulate the development of specialized cells, tissues, and organs during the embryonic development, tissue interactions and pattern formation, understand the experimental strategies and techniques that are used to identify the molecular and cellular mechanisms of development.

Students should be thoroughly acquainted with structures and development of the human body by means of classical and contemporary methods of microscopic investigations and embryonic development; they should master the skills of microscopy of the most characteristic cells, tissues, and organs presented as histological slides. By utilizing their previous knowledge in physics, chemistry, biochemistry, biology, and anatomy, students should gain insight into the normal structure of the human body by means of light and electron microscopy.

Course content

The major role of **histology** in the medical curriculum is to provide basic understanding of many different aspects of structure and function of the human body. Emphasis is placed on the normal structure as a basis for proper functioning and for understanding pathophysiological processes. The following topics and

subtopics will be considered: epithelial tissues (cellular membrane, basal lamina, cell-cell interactions); connective tissue (general characteristics, cells and intercellular substance, fibers, and ground substance); types of connective tissue (proper - dense, regular and irregular, adipose tissue); cartilage (hyaline elastic, fibrocartilage); bone (microscopic structure of bones, bone cells, histogenesis of bone, synovial membrane), blood, lymphocytes and their immune role; muscular tissue (smooth, skeletal, cardiac muscle), nervous tissue (structure of neuron, nerve fiber, synapse and the relationship of neurons, neuroglia, choroid plexus); blood vascular system, lymphatic system, endocrine system, respiratory system, gastrointestinal tract, kidney and urinary tract, reproductive system, special senses.

The purpose of **embryology** is to provide students with a general outline of human development and to help them understand the complex relationship within the structure of the human body. Its practical medical implications are also of great importance since it can explain developmental anomalies and their molecular origins. The following topics and subtopic will be covered: fertilization, cleavage, gastrulation and formation of primary germ layers; differentiation of primary germ layers and organogenesis; cellular and molecular mechanisms that control tissue morphogenesis and differentiation; mechanisms that control differential gene expression leading to cell and tissue differentiation; extraembryonic coelom, connecting stalk, amnion, corium, placenta; neural plate, groove and tube; sex cycles, male and female sex organs; embryonic and fetal development; relationships between congenital malformations and errors in embryological development; environmental factors as causes of birth defects; development and anomalies of body systems; prenatal diagnostics.

Student obligations:

Students are obliged to be prepared theoretically for seminars and practicals according to the executive education plan and this will be continuously checked. This course encourages discussion, individualized study, and work in small groups.

Class attendance, including test attendance, is mandatory. Students may be absent from 30% of each form of classes, provided they have a justifiable cause. If a student is absent for more than 30% of classes, they will have to re-enroll the course.

Students are expected to actively participate in all aspects of the course, complete reports from practicals on time, and attend the examinations. During LP, a student is obligated to have tools (a notebook, a blue and a red pencil, white coat).

As current epidemiological conditions do not allow direct teaching, it will be conducted according to the hybrid model as follows:

Lectures - recorded lectures that include individual teaching units will be available to the student on the Merlin platform of the course according to the schedule specified in the course syllabus.

Seminars and laboratory practical - will take place in the lecture halls of the faculty according to the schedule in the syllabus with the use of histological images from the atlas and microscopic slides.

In the case that students are unable to attend classes due to the deteriorating epidemiological situation, seminars and practical will be held in real time using the MS Teams platform following the group schedule listed in the syllabus.

Students will be able to come on-site for consultations before each partial test and before the final exam. Consultations will be held in the lecture halls of the faculty in the terms provided for lectures (in accordance with the epidemiological instructions). The schedule of consultations will be agreed with students. Consultations will also be organized on-site for the repetition of histological slides with the Institute's demonstrators. If necessary, all this consultation will be organized online.

Required literature:

1. A.L. Mescher.: Junqueira's Basic Histology, XIV edition, The McGraw –Hill Education, New York 2016.
2. T.W.Sadler: Langman's Medical Embryology, XIII edition, Wolters Kluwer Health, Philadelphia,2015.
3. <http://medsci.indiana.edu/junqueira/virtual/junqueira.htm>
4. <https://accessmedicine.mhmedical.com/book.aspx?bookid=2430>

Recommended for additional reading:

--

Course teaching plan:

The list of lectures (with titles and learning outcomes):

<p>L1 Importance of Histology in Understanding Human Tissue Formation and Function To understanding the aim of the course. To recognize the role of Histology as a foundation for subsequent studies in pathology and physiology.</p> <p>L2 Epithelial Tissue To define the microscopic structure and function of epithelial cells. To describe characteristic features of various types of epithelia.</p> <p>L3-4 Connective Tissue, Blood To explain the types, characteristics, and functions of the connective tissue. To describe and to define cells and ground substance (fibers and basic substances) of connective tissue proper, and connective tissues with special properties. To define the peculiarities of microscopic and submicroscopic blood cells - erythrocytes, leukocytes, and platelets, and blood plasma. To adopt criteria for classification of blood cells based on their morphology.</p> <p>L5-6 Cartilage, Joints, Bone, Osteogenesis To explain the classification, characteristics, and functions of supporting connective tissue. To define the ECM of different types of cartilage tissue. To explain the growth and healing processes of cartilage tissue damage. To explain the histological characteristics of joints. To explain the classification, characteristics, and functions of supporting connective tissue. To define the peculiarities of cells and bone matrix. To explain the characteristics of primary and secondary bone tissue with respect to their histological properties. To explain the processes of intramembranous and endochondral ossification. To describe features of fracture bone remodeling and repair.</p> <p>L7-8 Muscle Tissue, Circulatory System To explain the classification, characteristics, and functions of three types of muscle tissue. To define cellular and ECM properties of smooth, skeletal, and cardiac muscle. To explain the ultrastructure of muscle fibers and morphological conditions for the possibility of contraction. To describe the histological structure of heart and vasculature.</p> <p>L9 Endocrine System To describe the classification, characteristics, and functions of the endocrine system. To define the specificity of the histological structure of certain endocrine glands; pituitary gland, epiphysis, thyroid, parathyroid glands, adrenal glands.</p> <p>L10-11 Nerve Tissue, Nervous System To explain the classification, characteristics, and functions of nerve cells (neurons and glial cells). To explain the processes of central and peripheral myelination. To define the cells and interstitial substances of certain parts of the central and peripheral nervous system (big and small brain, spinal cord, ganglia, peripheral nerves). To explain the ultrastructure of the nerve cells, the ability to transmit the signal, and the structure of the synapse. To describe the histological structure of meninges and blood-brain barrier.</p> <p>L12-13 Female Reproductive System, Sex Cycles, First Week, Second Week and Third Week of Development To define the peculiarities of histological characteristics of the female reproductive system during different periods of a woman's life. To learn and adopt knowledge about sex cycles in male and female sex. To understand and explain changes during the generative period of life. To overcome the peculiarities of changes during the first week of development of the fertilized ovary (zygote). To outline the general changes during the second week (implantation, two-layered sham) and the third week (gastrulation) of development</p>

L14 Male Reproductive System

To define the peculiarities of the histological structure of testes, epididymis, accessory glands.

L15-16 Embryology – Body Cavities, Placenta

To adopt knowledge about the development and function of fetal membranes: trophoblasts, amnions, coronas, egg yolks. To understand the development, texture, and function of placenta and umbilicus in different periods of pregnancy. To understand the utero-placental bloodstream.

L17 Ear – Structure and Development

To define the histological structure of various parts of the external, middle, and internal ear. To understand the function of individual parts of the internal ear. To describe the developmental processes that enable the emergence of the outer, middle, and inner ear.

L18 Immune system – Structure and Development

To explain the characteristics and functions of the immune system. To define the histological structure of the thymus, lymph nodes, spleen, and tonsils. To describe the developmental processes that lead to the formation of the lymph system organs.

L19-20 Eye – Structure and Development

To define the peculiarities of the histological structure of the individual structures of the eye. To understand and explain the texture and function of the lens, cilia muscle, and individual parts of the retina. To explain the processes of optic cup development and formation of various parts of eye layers.

L21 Digestive tract – Oral Cavity

To define the general structure of the digestive tract. To describe the peculiarities of organs in the oral cavity. To explain the structure of primary and permanent teeth. To explain the processes of denture formation in primary and secondary dentition. To define the processes that lead to tooth eruptions.

L22-23 Digestive Tract

To describe the peculiarities of organs - esophagus, stomach, intestine, organs associated with the digestive tract – salivary glands, liver, pancreas, gallbladder.

L24 Digestive tract – Development

To understand the developmental processes of various organs of digestive tract formation.

L25,26 Skin and Derivates – Structure and Development

To describe the structure and function of thin and thick skin layers. To understand and explain the structure of the skin glands and sensory receptors. To describe the main features of hair and nails. To explain the developmental processes that allow the formation of individual skin layers and skin derivatives.

L27 Respiratory system – Structure

To define histological characteristics of parts forming the respiratory system (respiratory and olfactory region of the nose, paranasal sinuses, lungs, bronchi, bronchioles, alveoli). To understand and explain the structure and function of the blood-air barrier.

L28-29 Cardiovascular and Respiratory System Development

To understand the patterning of primary heart field, cardiac, and vascular development. To describe the developmental processes that lead to the formation of lymphatic capillaries and vessels. To describe the developmental processes of forming the respiratory system.

L30 Urinary system – Structure

To explain the basic characteristics of the structure and function of the urinary system. To define the peculiarities of the kidney structure - especially the cortex, the ureter, the bladder, the male and female urethra. To describe parts of the nephron. To define the characteristics of the transient epithelium.

L31-32 Urogenital system – Development

To understand and describe the processes that lead to the development of three generations of kidneys, the formation of the urethra, ureter, and urinary bladder. To understand the developmental process that leads to the normal male and female reproductive system - sexual glands and sex organs of the male and female sex.

L33-34 Birth Defects, Teratology

To define critical periods of development and to indicate teratogenic factors. To understand and explain the possibility of the emergence of anomalies and clinically important disorders that arise during development.

The list of seminars (S) and laboratory practicals (LP) with short explanations:

During seminars, students discuss in more detail themes introduced on the lectures and explain the unclear and insufficiently understandable topics. The seminars also provide an introduction to the topics that will be revealed on practicals. Students' theoretical knowledge for each seminar is checked and students are therefore obliged to come prepared for this form of teaching. LP are followed by lecture topics or seminars that precede. The practical part of the practicals involves an overview of histological images of tissues and organs using microscopes and atlases mentioned in the literature list as well as drawing and a discussion with the teacher and demonstrator. The student is expected to be able to recognize the structures of various tissues and organs on microphotography, to be able to relate the observed details to the function of tissues or organs, and to be able to extract important characteristics of an unknown microscopic slide, compare with known structures and determine which organ or tissue is involved.

Students must have the appropriate drawing equipment (wooden pencils - red and blue) and a notebook (without lines) and white coats. Their participation in classes, understanding of the preparations, and their ability to recognize microscopic structures are evaluated in each LP. Thus, the student prepares to pass the Tissue Recognition Test at the end of the course, in which the same materials (atlas) will be used. In the description of learning outcomes for each seminar and LP, a list of histological slides is added.

S1LP1 Histology and its Methods of Study

To explain the basic facts of the development of histological techniques and microscopy. To get acquainted with and acquire knowledge about the way of preparing classic histological slides, as well as various histological, histochemical, and immunohistological techniques. To explain the principle of the methods used in histology laboratories and microscopy.

S2LP2 Epithelial Tissue

To classify and describe the microscopic and submicroscopic structure of epithelial cells. To define the peculiarities of certain types of glandular epithelia.

(dental pulp - endothelium, small intestine – simple columnar, goblet cells, simple tubular glands, esophagus – squamous moist, mucous glands, skin – squamous dry, merocrine, holocrine, apocrine glands)

S3LP3 Connective Tissue, Blood

To explain the characteristics and functions of the connective tissue. To define cells and ECM (fibers and ground substances), connective tissue, and connective tissues with special properties. To compare the

similarities and differences between these two types of tissues. To define the peculiarities of microscopic and submicroscopic structure of blood cells. To adopt criteria for blood cell on the basis of their morphology. (mesenchyme, skin – intravital staining, tendon, epicardium, blood smear)

S4 Bone marrow, hematopoiesis

To describe histological characteristics of bone marrow. To understand the emergence of individual blood cells during intrauterine development, as well as the basis of the hematopoietic process later in life.

S5LP4 Cartilage, Bone

To define cellular and interstitial parts of different types of cartilage tissue. To explain the growth and healing processes of cartilage tissue damage. To explain the characteristics of the histological structure of joints. To define the peculiarities of cells and ECM of bone tissue. To explain the characteristics of primary and secondary bones with respect to their histological properties. To explain the processes of osteogenesis, the fracture healing process, and bone remodeling.

(trachea, ear auricle – HE, orcein staining, meniscus, ground bone, decalcified bone, fetal skull and finger, bone marrow)

S6LP5 Muscle Tissue, Circulatory System

To clearly define cellular and interstitial properties of smooth, skeletal, and cardiac muscle tissue. To explain the ultrastructure of muscle cells and morphological conditions for the possibility of contraction in all types of muscle tissue. To describe the histological structure of the heart, artery, and vein. To adopt the classification of blood capillaries based on their microscopic structure.

(skeletal, cardiac, smooth muscle, endocardium, small artery and vein – HE, orcein staining)

S7LP6 Nerve Tissue, Nervous System

To explain the classification, characteristics, and functions of nerve cells (neurons and glial cells). To explain the processes of central and peripheral myelination. To define the cells and interstitial substances of certain parts of the central and peripheral nervous system (big and small brain, spinal cord, ganglia, peripheral nerves). To explain the ultrastructure of the nerve cells, the ability to transmit the signal, and the structure of the synapse. To describe the histological structure of meninges and blood-brain barrier.

(spinal cord and cerebellum – HE, silver staining, cerebrum, nerves, sensory, autonomic ganglia)

S8LP7 Endocrine System

To describe the classification, characteristics, and functions of the endocrine system. To define the specificity of the histological structure of certain endocrine glands; pituitary gland, epiphysis, thyroid, parathyroid glands, adrenal glands.

(pituitary gland, adrenal gland, thyroid gland, pineal gland)

S9 Embryology – developmental processes, Gametogenesis

To describe the basis of key signaling pathways for development, and some basis of organ formation. To explain the process of conversion of germ cells into male and female gametes. To understand and explain the processes of gametogenesis and the difference between spermatogenesis and oogenesis.

To become familiar with the goal of learning developmental processes, fertilization, embryonic and fetal development of human embryos. To understand the underlying developmental processes: proliferation, migration, induction, differentiation, programmed morphogenic cell death

S10LP8 Female Reproductive System

To learn about sex cycles in male and female sex. To understand and explain changes in histological structure in the ovaries and testes that precede the emergence of mature sex cells.

(ovary, uterine tube, uterus, vagina)

S11LP9 Embryology I

To overcome the peculiarities of changes during the first week of development - zygote, pruning, second week – implantation, formation of a double layered shield. To overcome the peculiarities of changes during third week - embryonic, fetal development (neurulation, somitogenesis, germinal derivatives).
(embryo)

S12LP10 Embryology II

To explain the development of placental blood flow and function of embryonic envelopes – amnion, chorion, allantois, egg yolk sack. To understand the development, texture, and function of the placenta in different periods of pregnancy.
(chorionic villi, umbilical cord)

S13 Head and Neck Development

To explain and describe the processes that lead to the development of individual structures in the head and neck area. To adopt knowledge on the origin of the pharyngeal arches and its derivatives, the appearance of stomodeum and its differentiation during the embryonic and fetal developmental period. To describe the development of the temporomandibular joint.

S14LP11 Immune System – Structure and Development

To explain the characteristics and functions of the immune system. To define the histological structure of the thymus, lymph nodes, spleen, and tonsils. To describe the developmental processes that lead to the formation of the lymph system organs and lymphatic capillaries and vessels.
(thymus, lymph node, spleen, tonsil)

S15LP12 Ear – Structure and Development

To define the histological structure of various parts of the external, middle, and internal ear. To understand the function of individual parts of the internal ear. To describe the developmental processes that enable the emergence of the outer, middle, and inner ear.
(auricle, inner ear)

S16LP13 Eye – Structure and Development

To define the peculiarities of the histological structure of the individual structures of the eye. To understand and explain the texture and function of the lens, cilia muscle, and individual parts of the retina. To explain the processes of optic cup development and formation of various parts of eye layers.
(cornea, iris, ciliary body, lens, retina, development of eye – early, late stage)

S17LP14 Oral Cavity – Structure and Development

To define the peculiarities of the individual parts of the oral cavity - lip, tongue, palate. To gain knowledge about the origin of the gastrointestinal tract, and the appearance of the stomodeum and its differentiation during the embryonic and fetal period. To describe the development of the palate, the tongue, and the upper and the lower jaw.
(lip, tongue, filiform and vallate papillae, salivary glands)

S18LP15 Teeth – Structure and Development

To explain the histological structure of different parts of human teeth and processes of denture formation in primary and secondary dentition.
(dentin, cementum, enamel, gingiva, enamel organ – early, late stage)

S19LP16 Digestive Tube – Structure and Development

To define the histological structure of certain parts of the digestive tract (esophagus, stomach, intestine, and

colon). To understand and explain the structure and function of the individual layers in the structure of various segments. To explain the processes of formation of various organs.
(esophagus, stomach, small intestine, large intestine, vermiform appendix)

S20LP17 Digestive Glands – Structure and Development

To understand and explain the structure and function of intestinal glands. To understand and explain the flow of blood and bile inside the liver. To describe the formation of glands associated with the digestive system
(liver, pancreas, gallbladder).

S21LP18 Respiratory System – Structure and Development

To define the basics of development and the peculiarities of the histological structure of the individual parts of the respiratory system (respiratory and nerve region, nose, paranasal sinuses, lungs, bronchi, bronchioles, alveoli). To understand and explain the structure and function of the blood-air barrier.
(nasal cavity, trachea, lungs)

S22LP19 Skin – Structure and Development

To clearly define the peculiarities of the histological structure of the skin. To understand and explain the facts about the skin glands. To describe hair and nails. To explain developmental processes that allow the formation of individual skin layers and skin derivatives. To adopt knowledge about differences in appearance and function of the breast and breastfeeding between pregnant women and women that are not pregnant.

(thin skin with glands – axilla, hair, thick skin, mammary gland – 2 stages)

S23 Central Nervous and Endocrine System Development

To explain and describe the processes of the formation and differentiation of nerve and glial cells, and the formation of nerve tissue during early neurogenesis. To understand the development of individual parts of the central and peripheral nervous system. To understand the development of endocrine glands connected to nervous system.

S24 Muscular System, Limbs, Axial Skeleton – Development

To understand and explain the processes leading to differentiation of mesoderm and the formation of certain groups of skeletal and smooth muscles and the muscular wall of the heart. To explain the emergence of certain parts of the skeletal system - skull, spine, ribs, pelvis, limbs.

S25LP20 Urinary system – Structure and Development

To explain the basic characteristics of the structure and function of the urinary system. To define the peculiarities of the kidney structure - especially the cortex, the ureter, the bladder, the male and female urethra. To describe parts of the nephron. To define the characteristics of the transient epithelium. To understand and describe the processes that lead to the development of three generations of kidneys, the formation of the urethra, ureter, and urinary bladder

(kidney, ureters, bladder)

S26LP21 Male Reproductive System – Structure and Development

To define the peculiarities of the histological structure and its development of testes, epididymis, accessory glands.

(testes, epididymis, vas deferens, prostate gland)

S27 Cardiovascular System Development

To understand the patterning of primary heart field, cardiac, and vascular development.

LP22 Tissue section repetition

LP23 Tissue section slide recognition

Student obligations:

Class attendance, including test attendance, is mandatory. Students may be absent from 30% of each form of teaching provided they have a justifiable cause. If a student is absent for more than 30% of the classes, they will have to re-enroll the course.

Students are expected to actively participate in all aspects of the course, complete laboratory reports on time, and attend the examinations. Moreover, preparation of the course content, which is going to be discussed during seminars and laboratory practicals, is obligatory.

Exam (exam taking, detailed exam description of the oral/written/practical part, point distribution, grading criteria):

Student grading will be conducted according to the current Ordinance on Studies of the University of Rijeka (approved by the Senate) and the Ordinance on Student Grading at the Faculty of Medicine in Rijeka (approved by the Faculty Council).

Assessment of student work

Student work will be assessed and graded during the course and on the final exam. During the course, students may obtain a total of 100 grade points (credits). Students can achieve up to 70% of the final grade during the classes, and a maximum of 30% of the final grade at the final exam.

Evaluation of students' progress during classes, midterms, and the final exam in the academic year 2020/2021 is shown in Table 1.

Table 1. Distribution of grade points in the course "Histology and Embryology"

	Evaluation	Grade points
Midterm exams	Midterm exam I	21
	Midterm exam II	21
	Total	42
Seminars, Laboratory practicals	Active participation/short written exams Completed practicals and an accepted written report	10
Tissue section recognition		18
TOTAL		70
	Oral exam	30
	Total	30
TOTAL		100

Written midterm exams

During the semester, two written midterm exams are planned that will include the content of lectures, seminars, and laboratory practicals. MT I – general histology and basic embryology. MT II – histology and embryology of various organs.

At each midterm exam, the maximum of grade points that a student can obtain is 21.

All written midterm exams consist of 70 multiple-choice questions and are evaluated according to the criteria

shown in Table 2.

MT I – during week 15. – 19.11.2021.

MT II – during week 24. – 28.01.2022.

Table 2. Evaluation of written midterm exams

No. of correctly answered questions	Grade points/credits
30 – 34	8
35 – 39	12
40 – 44	14
45 – 49	16
50 – 54	18
55 – 59	19
60 – 64	20
65 – 70	21

Correction of the midterm exams

A student can access the correction of the midterm exams if they: i) did not obtain a minimum criteria (50% on each midterm) or ii) are not satisfied with the obtained credits and iii) in case of absence at the midterm exam due to a justified reason.

If a student retakes the midterm exam because they are not satisfied with the obtained grade points, only the credits gained from the retaken midterms will be considered.

Evaluation of the midterm corrections will be performed according to the criteria shown in Table 2.

Students will have the opportunity to correct one or more midterm exam only once. Correction of the midterm exam I-II will be held after completing regular classes in terms set by the course schedule, before final exams in February and June.

Seminars and laboratory practicals

A student can obtain 10 credits (Table 3) throughout seminars and laboratory practicals after passing through 20 Topics (listed below). Evaluation of laboratory practicals implies a completed and accepted written report with all slides drawings. During laboratory practicals and seminars, the oral examination can be performed by the teacher or through short written exams.

Table 3. Evaluation of seminars and laboratory practicals

Topics evaluation	Grade points/credits
2,0 – 2,5	5
2,6 – 3,0	6
3,1 – 3,5	7
3,6 – 4,0	8
4,1 – 4,5	9
4,6 – 5,0	10

Topics

T1 – Epithelial Tissue

T2 – Connective Tissue, Blood, Cartilage,

T3 – Bone, Osteogenesis, Bone Remodeling, Bone Marrow

T4 – Muscle Tissue, Circulatory System

T5 – Nerve Tissue, Nervous System
T6 – Endocrine Glands
T7 – Female Reproductive System, Gametogenesis, First Week of Development
T8 – Second, Third Week of Development, Embryonic Period, Fetus, Fetal Membranes, Placenta, Twins
T9 – Nervous System and Endocrine System Development
T10 – Eye – Structure and Development
T11 – Ear – Structure and Development
T12 – Oral Cavity – Structure and Development, Teeth – Structure and Development
T13 – Digestive Tract – Structure and Development
T14 – Organ Associated with DT – Structure and Development
T15 – Skin and Derivates – Structure and Development
T16 – Immune System – Structure and Development
T17 – Urinary System – Structure and Development
T18 – Male Reproductive System – Structure and Development
T19 – Respiratory System – Structure and Development
T20 – Cardiovascular System – Development

Tissue section recognition

Is a compulsory oral exam and is required for students to be qualified for the final exam. A student must identify at least 10 of the 12 microscopic slides, as well as the structures that are described (and drawn) during the laboratory practicals, and can receive a maximum of 18 points. At least 9 points are required for passing the exam. Each slide is evaluated with $\frac{1}{2}$, 1, or $1\frac{1}{2}$ points depending on the student's knowledge.

This exam will be held in the week before each final exam. At that time, the student can access the Tissue section recognition several times. Accurate dates and hours will be determined in agreement with the students.

Final exam

The final oral exam is mandatory and covers the entire course content. During the final exam, students can obtain a maximum of 30 credits.

Assessment of the oral part of the final exam:

- up to 15 credits: minimum criteria satisfied
- 16 – 20 credits: average criteria satisfied with noticeable errors
- 21 – 25 credits: answers with a few errors
- 26 – 30 credits: outstanding answers.

If a student is not satisfied with the final grade, they may refuse the grade. In case a student does not accept the grade, he/she must re-enter the final exam.

Conditions for admission to the final exam

A student who accomplishes 35 or more grade points during all course classes and/or after correction of the midterm exams, and passes Tissue section recognition with a minimum of 9 points can access the final exam.

A student who achieves less than 35 grade points during all course classes even after the correction of the midterm exams, or didn't achieve a minimum of 9 point on Tissue section recognition or is absent for more than 30% of all forms of classes, is graded as unsuccessful (F) and must re-enter the course.

Final grade

The final grade represents a sum of all grade points obtained during all course classes and on the final exam. Students are evaluated according to the ECTS (A-F) and numerical (5-1) system.

The ECTS and the numerical grading system are defined by the following criteria:

A (5) 90 – 100 credits
B (4) 75 – 89 credits
C (3) 60 – 74 credits
D (2) 50 – 59 credits
F (1) 0 – 49 credits

Other important information regarding the course:

Teaching is held at the prescribed time and it is not possible to enter after the teacher enters. Food and beverages are not permitted in the classroom or in the laboratory. This includes plate lunches, drinks, candies, etc., whether opened or not. Likewise, cell phones are not allowed in the classroom during the midterm or final exams. Students must arrive on time for exam attendance. Anyone late for more than 15 minutes may be refused to undertake the exam.

Academic Honesty

It is expected that all students and teachers follow the Code of Academic Honesty in accordance with the Code of Ethics for the students of the Faculty of Medicine at the University of Rijeka.

Please read the policy regarding academic honesty at:

<http://medical-studies-in-english.com/wp-content/uploads/2016/12/CODE-OF-ETHICS.pdf>

Contact information

For questions and concerns, please feel free to contact us by e-mail or via the Department's website.

If you want to speak with a teacher during office hours (each working day between 11:00 am and 13:00 am), please let us know by e-mail or in class.

Expected competencies at course enrollment:

Students are expected to have basic knowledge of biology and anatomy.

COURSE SCHEDULE for academic year 2021/2022

Datum	Lectures	Seminars Laboratory Practicals	Lecturer
1 st week 04/10/2021	L1, 2, 3 8:15-11:00		Prof.dr.sc. E.Pernjak Pugel Prof.dr.sc. B.Polić
05/10/2021		S1/LP1 (group II) 8:30-10:45	Prof.dr.sc. T.Lenac Roviš
		S1/LP1 (group I) 11:15-13:30	Prof.dr.sc. T.Lenac Roviš
06/10/2021		S1/LP1 (group III) 08:30-10:45	Prof.dr.sc. T.Lenac Roviš
	L4 11:15-12:00		Prof.dr.sc. E.Pernjak Pugel
07/10/2021			
08/10/2021	L5,6 08,15-10,00		Prof.dr.sc. A.Krmpotić
2nd week 11/10/2021		S2/LP2 (group III) 8:30-10:45	Prof.dr.sc. E.Pernjak Pugel / T.Jenuš mag. biotech. in med.
		S2/LP2 (group I) 13:30-15:45	Prof.dr.sc. E.Pernjak Pugel / T.Jenuš mag. biotech. in med.
12/10/2021		S2/LP2 (group II) 08:30-10:45	Prof.dr.sc. E.Pernjak Pugel / T.Jenuš mag. biotech. in med
		S3/LP3 (group III) 11:15-13:45	Prof.dr.sc. B.Polić / Dr.sc. P.Kučan
		S3/LP3 (group I) 14:00-16:30	Prof.dr.sc. B.Polić / Dr.sc. P.Kučan
13/10/2021		S3/LP3 (group II) 08:15-10:45	Prof.dr.sc. B.Polić / Dr.sc. P.Kučan
		S4 11:15-12:00	Izv.prof.dr.sc. F. Wensveen
14/10/2021			
15/10/2021	L7,8 08,15-10,00		Doc. B.Lisnić
3rd week 18/10/2021		S5/LP4 (group III) 8:15-10:45	D. Kveštak, mag.biol.mol./ Prof.dr.sc. A.Krmpotić
		S5/LP4 (group I) 13:30-16:00	D. Kveštak, mag.biol.mol./ Prof.dr.sc. A.Krmpotić
19/10/2021		S5/LP4 (group II) 08:15-10:45	D. Kveštak, mag.biol.mol./ Prof.dr.sc. A.Krmpotić
		S6/LP5 (group I) 11:15-13:45	Doc.dr.sc. B. Lisnić / Dr.sc. L.Hiršl
		S6/LP5 (group III) 14:00-16:30	Doc.dr.sc. B. Lisnić / Dr.sc. L.Hiršl
20/10/2021		S6/LP5 (group II) 08:15-10:45	Doc.dr.sc. B. Lisnić / Dr.sc. L.Hiršl

	L9 11:15-12:00		Izv.prof.dr.sc. F. Wensveen
21/10/2021			
22/10/2021	L10,11 08,15-10,00		Prof.dr.sc. E.Pernjak Pugel
4th week 25/10/2021		S7/LP6 (group III) 8:15-10:45	D. Kveštak, mag.biol.mol / Prof.dr.sc. E.Pernjak Pugel
		S7/LP6 (group I) 13:30-16:00	D. Kveštak, mag.biol.mol / Prof.dr.sc. E.Pernjak Pugel
26/10/2021		S7LP6 (group II) 08:15-10:45	D. Kveštak, mag.biol.mol / Prof.dr.sc. E.Pernjak Pugel
		S8/LP7 (group III) 11:15-13:15	Doc.dr.sc. F. Wensveen / Dr.sc. I.Kavazović
		S8/LP7 (group I) 13:30-15:30	Doc.dr.sc. F. Wensveen / Dr.sc. I.Kavazović
27/10/2021		S8/LP7 (group II) 08:45-10:45	Doc.dr.sc. F. Wensveen / Dr.sc. I.Kavazović
	S9 11:15-12:00		Izv.prof.dr.sc. J.Tomac
28/10/2021			
29/10/2021	L12,13 08,15-10,00		Prof.dr.sc. E.Pernjak Pugel
5th week 01/11/2021			
02/11/2021		S10/LP8 (group II) 8:30-10:45	dr.sc. M.Gulin / Prof.dr.sc. J.Tomac
		S10/LP8 (group I) 11:15-13:30	dr.sc. M.Gulin / Prof.dr.sc. J.Tomac
03/11/2021		S10/LP8 (group III) 8:30-10:45	dr.sc. M.Gulin / Prof.dr.sc. J.Tomac
	L14 11:15-12:00		Prof.dr.sc. J.Tomac
04/11/2021			
05/11/2021	L15,16 08,15-10,00		Prof.dr.sc. E.Pernjak Pugel
6th week 08/11/2021		S11/LP9 (group III) 8:15-10:45	dr.sc. M.Šustiĉ / Prof.dr.sc E.Pernjak Pugel
		S11/LP9 (group I) 13:30-16:00	dr.sc. M.Šustiĉ / Prof.dr.sc E.Pernjak Pugel
09/11/2021		S11/LP9 (group II) 08:15-10:45	dr.sc. M.Šustiĉ / Prof.dr.sc E.Pernjak Pugel
		S12LP10 (group III) 11:15-13:45	Prof.dr.sc E.Pernjak Pugel
		S12LP10 (group I) 14:00-16:30	Prof.dr.sc E.Pernjak Pugel
10/11/2021		S12LP10 (group II) 08:15-10:45	Prof.dr.sc E.Pernjak Pugel

	S13 11:15-12:00		Prof.dr.sc. B.Polić
11/11/2021			
12/11/2021	L17, 18 08,15-10,00		Prof.dr.sc. J.Tomac
7th week	Midterm exam I		
15/11/2021			
16/11/2021			
17/11/2021			
18/11/2021			
19/11/2021	L19, L20 08,15-10,00		Dr.sc. I.Brzić Prof.dr.sc. J.Tomac
8th week		S14/LP11 (group III) 8:45-10:45	dr.sc. I.Kavazović / Prof.dr.sc. J.Tomac
22/11/2021		S14/LP11 (group I) 13:30-15:30	dr.sc. I.Kavazović / Prof.dr.sc. J.Tomac
23/11/2021		S14/LP11 (group II) 08:45-10:45	dr.sc. I.Kavazović / Prof.dr.sc. J.Tomac
		S15/LP12 (group I) 12:30-14:15	Prof.dr.sc. B.Polić / Doc.dr.sc. I.Brzić
		S15/LP12 (group III) 15:15-17:00	Prof.dr.sc. B.Polić / Doc.dr.sc. I.Brzić
24/11/2021		S15/LP12 (group II) 09:00-10:45	Prof.dr.sc E.Pernjak Pugel
	L21 11:15-12:00		Prof.dr.sc. B.Polić
25/11/2021			
26/11/2021	L22, L23 08,15-10,00		Doc.dr.sc. I.Brzić Prof.dr.sc. J.Tomac
9th week		S16/LP13 (group III) 8:15-10:45	Prof.dr.sc E.Pernjak Pugel / dr.sc. P.Kučan
29/11/2021		S16/LP13 (group I) 13:30-16:00	Prof.dr.sc E.Pernjak Pugel / dr.sc. P.Kučan
30/12/2021		S16/LP13 (group II) 08:15-10:45	Prof.dr.sc E.Pernjak Pugel / dr.sc. P.Kučan
		S17/LP14 (group I) 12:15-14:00	J.Železnjak, mag.ing.mol.biotech / Prof.dr.sc. J.Tomac
		S17/LP14 (group III) 15:15-17:00	J.Železnjak, mag.ing.mol.biotech / Prof.dr.sc. J.Tomac
01/12/2021		S17/LP14 (group II) 09:00-10:45	J.Železnjak, mag.ing.mol.biotech / Prof.dr.sc. J.Tomac
	L24 11:15-12:00		Doc.dr.sc. V. Juranić Lisnić
02/12/2021			

03/12/2021	L25,26 08,15-10,00		Prof.dr.sc E.Pernjak Pugel
10th week 06/12/2021		S18/LP15 (group III) 8:45-10:45	Dr.sc. L.Hiršl / Prof.dr.sc. J.Tomac
		S18/LP15 (group I) 13:30-15:30	Dr.sc. L.Hiršl / Prof.dr.sc. J.Tomac
07/12/2021		S18/LP15 (group II) 08:45-10:45	Dr.sc. L.Hiršl / Prof.dr.sc. J.Tomac
		S19/LP16 (group I) 12:15-14:45	Doc.dr.sc. V. Juranić Lisnić / Dr.sc. M.Mazor
08/12/2021		S19/LP16 (group II) 8:15-10:45	Doc.dr.sc. V. Juranić Lisnić / Dr.sc. M.Mazor
	L27 11:15-12:00		Prof.dr.sc. B.Polić
09/12/2021		S19/LP16 (group III) 08:15-10:45	Doc.dr.sc. V. Juranić Lisnić / Dr.sc. M.Mazor
10/12/2021	L28, L29 08,15-10,00		Prof.dr.sc E.Pernjak Pugel
11th week 13/12/2021		S20/LP17 (group III) 8:30-10:45	Dr.sc. M.Gulin / Prof.dr.sc E.Pernjak Pugel
		S20/LP17 (group I) 13:30-15:45	Dr.sc. M.Gulin / Prof.dr.sc E.Pernjak Pugel
14/12/2021		S20/LP17 (group II) 08:30-10:45	Dr.sc. M.Gulin / Prof.dr.sc E.Pernjak Pugel
		S21/LP18 (group I) 11:15-13:00	Doc.dr.sc. F. Wensveen / A.Benić, mag.mol.biol.
		S21/LP18 (group III) 14:15-16:00	Doc.dr.sc. F. Wensveen / A.Benić, mag.mol.biol.
15/12/2021		S21/LP18 (group II) 09:00-10:45	Doc.dr.sc. F. Wensveen / A.Benić, mag.mol.biol.
	L30 11:15-12:00		Doc.dr.sc. V. Juranić Lisnić
16/12/2021			
17/12/2021	L31, L32 08,15-10,00		Prof.dr.sc E.Pernjak Pugel
12th week			
13th week 10/01/2022		S22/LP19 (group III) 8:30-10:45	Doc.dr.sc. V. Juranić Lisnić / doc.dr.sc. I.Brizić
		S22/LP19 (group I) 11:30-13:45	Doc.dr.sc. V. Juranić Lisnić / doc.dr.sc. I.Brizić
11/01/2022		S22/LP19 (group II) 08:30-10:45	Doc.dr.sc. V. Juranić Lisnić / doc.dr.sc. I.Brizić
		S23 (group I) 12:15-14:00	Prof.dr.sc E.Pernjak Pugel
		S23 (group III)	Prof.dr.sc E.Pernjak Pugel

		15:15-17:00	
12/01/2022		S23 (group II) 09:00-10:45	Prof.dr.sc E.Pernjak Pugel
	S24 11:15-12:00		Prof.dr.sc. J.Tomac
13/01/2022			
14/01/2022	L33, L34 08,15-10,00		Prof.dr.sc E.Pernjak Pugel
14th week 17/01/2021		S25/LP20 (group III) 8:45-10:45	Prof.dr.sc E.Pernjak Pugel / dr.sc. P.Kučan
		S25/LP20 (group I) 13:15-15:15	Prof.dr.sc E.Pernjak Pugel / dr.sc. P.Kučan
18/01/2021		S26/LP21 (group III) 8:45-10:45	Prof.dr.sc E.Pernjak Pugel / dr.sc. P.Kučan
		S25/LP20 (group II) 12:15-14:15	J.Železnjak, mag.ing.mol.biotech / Prof.dr.sc. J.Tomac
		S26/LP21 (group I) 15:15-17:15	J.Železnjak, mag.ing.mol.biotech / Prof.dr.sc. J.Tomac
19/01/2021		S26/LP21 (group II) 08:45-10:45	J.Železnjak, mag.ing.mol.biotech / Prof.dr.sc. J.Tomac
20/01/2021			
21/01/2021	S27 08,15-10,00		Prof.dr.sc E.Pernjak Pugel
15th week 24/01/2022		LP22 (group III) 8:45-10:45	Prof.dr.sc E.Pernjak Pugel
		LP22 (group I) 13:15-15:15	Prof.dr.sc E.Pernjak Pugel
25/01/2022		LP23 (group III) 8:45-10:45	Prof.dr.sc E.Pernjak Pugel
		LP22 (group II) 11:15-13:15	Prof.dr.sc E.Pernjak Pugel
		LP23 (group I) 13:30-15:30	Prof.dr.sc E.Pernjak Pugel
26/01/2022		LP23 (group II) 08:45-10:45	Prof.dr.sc E.Pernjak Pugel
27/01/2022			
28/01/2022		Midterm exam II	

List of lectures, seminars, and practicals:

	Lectures (topics)	Teaching Hours	Lecture Room
L1	Importance of Histology in Understanding Human Tissue Formation and Function	1	15
L2-3	Epithelial Tissue, Connective Tissue	2	15
L4	Blood	1	15
L5-6	Cartilage, Bone, Osteogenesis, Joints	2	1
L7-8	Muscle Tissue, Circulatory System	2	1
L9	Endocrine System	1	1
L10-11	Nerve Tissue, Nervous System	2	1
L12-13	Female Reproductive System, Sex Cycles, Fertilization, Implantation Second Week, Embryonic Period	2	1
L14	Male Reproductive System	1	15
L15-16	Embryology – Placenta, Fetus, Body Cavities	2	1
L17	Ear – Structure and Development	1	1
L18	Immune System – Structure and Development	1	1
L19-20	Eye – Structure and Development	2	1
L21	Digestive tract – Oral Cavity	1	15
L22-23	Digestive tract – Structure	2	1
L24	Digestive tract – Development	1	1
L25-26	Skin and Derivates – Structure and Development	2	1
L27	Respiratory system – Structure and Development	1	1
L28-29	Cardiovascular System Development	2	1
L30	Urinary System – Structure	1	1
L31-32	Urogenital System Development	2	8
L33-34	Birth Defects, Teratology	2	1
	Total number of lectures	34	

	Seminars (topics)	Teaching Hours	Lecture Room
S1	Histology and its Methods of Study	1	Department of Histology and Embryology
S2	Epithelial Tissue	2	Department of Histology and Embryology
S3	Connective Tissue, Cartilage	2	Department of Histology and Embryology
S4	Hemopoiesis, Bone Marrow	1	15
S5	Bone, Osteogenesis	2	Department of Histology and Embryology

S6	Muscle Tissue, Circulatory System	2	Department of Histology and Embryology
S7	Nerve Tissue, Nervous System	2	Department of Histology and Embryology
S8	Endocrine System	1	Department of Histology and Embryology
S9	Embryology – developmental processes, Gametogenesis	1	15
S10	Female Reproductive System	2	Department of Histology and Embryology
S11	Embryology I	3	Department of Histology and Embryology
S12	Embryology II - Placenta	3	Department of Histology and Embryology
S13	Head and Neck Development	1	8
S14	Immune System, Blood	1	Department of Histology and Embryology
S15	Ear	1	Department of Histology and Embryology
S16	Eye	2	Department of Histology and Embryology
S17	Oral Cavity	1	Department of Histology and Embryology
S18	Teeth	1	Department of Histology and Embryology
S19	Digestive tube	2	Department of Histology and Embryology
S20	Digestive Glands	1	Department of Histology and Embryology
S21	Respiratory System	1	Department of Histology and Embryology
S22	Skin	2	Department of Histology and Embryology
S23	Central Nervous and Endocrine System Development	3	Department of Histology and Embryology
S24	Muscular System, Limbs, Axial Skeleton – Development	1	1
S25	Urinary System	1	Department of Histology and Embryology
S26	Male Reproductive System	1	Department of Histology and Embryology
S27	Cardiovascular System Development	3	1
	Total	44	

	Laboratory practicals (topics)	Teaching Hours	Lecture Room
LP1	Methods in Histology	2	Department of Histology and Embryology

LP2	Epithelial Tissue	2	Department of Histology and Embryology
LP3	Connective Tissue, Cartilage	2	Department of Histology and Embryology
LP4	Bone, Osteogenesis	2	Department of Histology and Embryology
LP5	Muscle Tissue, Cardiovascular System	2	Department of Histology and Embryology
LP6	Nervous Tissue, Nervous System	2	Department of Histology and Embryology
LP7	Endocrine System	2	Department of Histology and Embryology
LP8	Female Reproductive System	2	Department of Histology and Embryology
LP9	Embryology I	1	Department of Histology and Embryology
LP10	Embryology II	1	Department of Histology and Embryology
LP11	Immune System, Blood	2	Department of Histology and Embryology
LP12	Ear	1	Department of Histology and Embryology
LP13	Eye	2	Department of Histology and Embryology
LP14	Oral Cavity	1	Department of Histology and Embryology
LP15	Teeth	2	Department of Histology and Embryology
LP16	Digestive Tube	2	Department of Histology and Embryology
LP17	Digestive Glands	2	Department of Histology and Embryology
LP18	Respiratory System	2	Department of Histology and Embryology
LP19	Skin	2	Department of Histology and Embryology
LP20	Urinary System	2	Department of Histology and Embryology
LP21	Male Reproductive System	2	Department of Histology and Embryology
LP22	Tissue section repetition	3	Department of Histology and Embryology
LP23	Tissue section slide recognition	3	Department of Histology and Embryology
	Total	44	

	Final exam dates
1.	02/02/2022
2.	16/02/2022
3.	06/07/2022
4.	01/09/2022
5.	15/09/2022