Sveučilište u Rijeci • Fakultet dentalne medicine
University of Rijeka • Faculty of Dental Medicine

Course: Histology with Embryology
Course Coordinator: Ester Pernjak Pugel, MD, PhD, Full Professor
Department: Department of Histology and Embryology
Study program: Integrated Undergraduate and Graduate University Study of Dental Medicine
Study year: first
Academic year: 2022/2023

SYLLABUS

Course description (a brief description of the course, general instructions, where and in what form the lessons are organized, necessary equipment, instructions for attendance and preparation for classes, student obligations, etc.):

Histology with Embryology is a compulsory course at the first year of the Integrated Undergraduate and Graduate University Study of Dental Medicine in English. It consists of 40 hours of lectures, 40 hours of seminars, and 40 hours of laboratory practicals, overall, 120 hours (8 ECTS).

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 student will be able to demonstrate a working knowledge of human histology and development and correlate the structure and function of human body. Students will acquire a reasonable working knowledge of how cells associate to perform the functions for which they are specialized and how organized groups of cells (tissues) are arranged to form the organ systems of the body.
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 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. Hard and soft parts of the teeth; enamel, dentine pulpal complex, suspensory apparatus of teeth, gingiva. Physiological movements of teeth, remodeling of dental tissues.

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. The following topics and subtopic will be covered: fertilization, cleavage, gastrulation and formation of primary germ layers; differentiation of primary germ layers and organogenesis; 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; prenatal diagnostics. Early development of teeth (bud, cap, bell) formation and characteristics of ameloblast, odontoblast, cementoblast; the formation of hard parts of teeth, amelogenesis, dentinogenesis, cementogenesis, development of desmodont and gingiva, tooth sprouting; interaction of mesenchyme and epithelial tissue during the development of hard and soft parts of the tooth. Development of the face and oral cavity, development of the temporomandibular joint.

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 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, microscopes, and histology slides.

Students will be able to come on-site for consultations before each midterm and before the final exam. 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.

Assigned reading:

T.W.Sadler: Langman’s Medical Embryology, XIII edition, Wolters Kluwer Health, Philadelphia,2015.

A.L. Mescher.: Junqueira’s Basic Histology, XIV edition, The McGraw –Hill Education, New York 2016.

Nanci A. Ten Cate's Oral Histology. Mosby, Elservier, 2012.

Optional/additional reading:

B.K.B. Berkovitz, BDS, MsC, PhD, G. R. Holland and B. L. Moxham, Oral Anatomy, Embryology & Histology, Mosby, 2017.

COURSE TEACHING PLAN:

The list of lectures (with topics and descriptions):

L1 Importance of Histology in Understanding Human Tissue Formation and Function

Explain the aim of the course. To recognize the role of Histology as a foundation for subsequent studies in pathology and physiology.

L2 Epithelial Tissue

To define the microscopic structure and function of epithelial cells. To describe characteristic features of various types of epithelia.

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.

L5,6 Cartilage, Joints, Temporomandibular Joint

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 mail characteristic and peculiarities of TMJ.

L7,8 Bone, Osteogenesis, Bone marrow

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.

To define the individualities of blood cells development.

L9 Immune system

To explain the characteristics and functions of the immune system. To define the histological structure of the thymus, lymph nodes, spleen, and tonsils.

L10,11 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.

L12 Introduction to tooth structure

Define to the student the complex structure of mineralized and non-mineralized tissues interconnected into the structural and functional organ - the tooth. Define and understand the physical and chemical characteristics of individual parts of the tooth as a prerequisite for its adequate function.

L13,14 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.

L15 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.

L16,17 Male Reproductive System, gametogenesis

To define the peculiarities of the histological structure of testes, epididymis, accessory glands. Understand and explain the processes of gametogenesis and the differences between spermatogenesis and oogenesis.

Get to know each other and adopt knowledge of sexual cycles in male sex.

L18,19 Female Reproductive System, Sex Cycles

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 female sex. To understand and explain changes during the generative period of life.

L20-25 Embryology – First Week, Second Week, Embryonic Period, Fetus, Body Cavities, Placenta

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

To describe changes during the first week of development of the fertilized ovary (zygote). To explain the general changes during the second week (implantation, two-layered embryonic disc) and the third week (gastrulation) of development. To explain the process during embryonic, fetal development, embryonic derivatives. 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 uterus-placental bloodstream.

L26 -28 Digestive tract (oral cavity, tube, gingiva, dental pulp)

Define the peculiarities of the histological structure of certain parts of the digestive tube (oral cavity, esophagus, stomach, small and large intestine).

Understand and explain the structure and function of individual layers in the structure of the digestive tube.

Understand and explain the structure of mucous membranes in certain parts of the oral cavity and the peculiarities of free and bound gingiva.

Get to know the morphological structure of dental pulp and dentin and understand their relationship with each other. Define the differences in chemical composition and physical characteristics between dentin and enamel and understand the consequent differences in their structure and function.

L29 -30 Digestive glands

To describe the peculiarities of organs associated with the digestive tract – salivary glands, liver, pancreas, gallblader. Define the peculiarities of the histological structure of salivary, pancreas and liver.

Understand and explain the structure and function of the serous and mucous glands.

Understand and explain the flow of blood and bile inside the liver.

L31,32,33 Important facts about tooth structure and development

Define complex processes in the organization and interaction of different types of cells involved in the formation and differentiation of individual teeth and surrounding tissues. Describe the morphological and functional characteristics of individual cell types and ways of their participation in the formed different structures of teeth and their physiological changes throughout life.

L34 Skin and derivates

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.

L35 Eye

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.

L36 Ear

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.

L37 Respiratory system

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.

L38 Urinary system

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.

L39,40 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 practicals (LP) with descriptions:

During seminars, students discuss in more detail themes introduced on the lectures and explain the unclear and insufficiently understandable topics. The seminars also introduce the topics that will be revealed on LP. 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 exercise involves an overview of histological images of tissues and organs using light microscopes and an atlas available on the Institute's website and other ones mentioned in literature list and 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). 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 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 immunohistology 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, skin – squamous dry)

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 based on their morphology.
(mesenchyme, skin – intravital staining, tendon, blood smear, epicardium)

S4LP4 Cartilage, mineralized tissues

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. Define the complex structure of mineralized and non-mineralized tissues interconnected into a structural and functional structure of bones and teeth.
(trachea, ear auricle – HE, orcein staining, meniscus)

S5LP5 Bone, bone marrow

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.
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.
(ground bone, decalcified bone, fetal skull and finger, bone marrow)

S6 Dentine-pulpal complex

To define the morphological structure of dental pulp and dentin and understand their relationship with each other. Define the differences in chemical composition and physical characteristics between dentin and enamel and understand the consequent differences in their structure and function.

S7 Enamel

Describe the morphological structure of enamel. Define and understand physical and chemical characteristics as a prerequisite for its adequate function

S8LP6 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)

S9LP7 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)

S10LP8 Immune System

To explain the characteristics and functions of the immune system. To define the histological structure of the thymus, lymph nodes, spleen, and tonsils.

(thymus, lymph node, spleen, tonsil)

S11LP9 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)

S12LP10 Male Reproductive System, spermatogenesis
To define the peculiarities of the histological structure of testes, epididymis, accessory glands.
(testes, epididymis, vas deferens, prostate gland)

S13LP11 Female Reproductive System
To understand and explain changes in histological structure in the ovaries that precede the emergence of mature sex cells. To explain the basic characteristics of the structure and function of the female reproductive organs.
(ovary, uterine tube, uterus, vagina)

S14 Embryology
To learn about sex cycles in male and female sex. 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 osteogenesis To overcome the peculiarities of changes during the first week of embryonal 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).

S15LP12 Embryology
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, embryo)

S16 Head and neck development
Describe the formation of the neural tube and the process of cranial bending of the fruit, get acquainted with the development of the stomodeum and pharynx arches. Describe in detail the development of the face, oral cavity, tongue, jaw and temporomandibular joint and the possibility of anomalies.

S17V13 Tooth – structure
Explain the structure of first and permanent teeth
(tooth ground section - enamel, dentine, decalcified tooth - pulp)

S18V14 Tooth – development
Explain the development of teeth. Explain the processes of tooth formation in primary and secondary dentition. Define the processes that lead to the eruption of the teeth.
(bud, cap, bell stages)

S19 Amelogenesis, dentinogenesis
Understand and define the processes of enamel development, the formation of enamel prisms, as well as the method of mineralization. Understand the differentiation and further development of ameloblasts, and their numerous functions during the formation of the tooth crown.
Understand and define the mechanism of dentin formation. Describe the development of odontoblasts and their function during the formation of the crown and root of the teeth. To

understand and compare with each other the characteristics of enamel and dentin development, ways of mineralization and the formation of characteristic structures (prisms in enamel, canals in dentin, etc.).

S20V15 Cementum, cementogenesis

Define cement and its types, periodontal ligament and bone tissue of dental alveoli and get acquainted with their morphological features. Understand the meaning and importance of the correct arrangement of elements in these structures. Describe the mechanism of cement formation and the formation of roots in teeth with one or more roots.
(tooth – ground section – cementum, decalcified tooth – periodontal ligament, gingiva)

S21 Tooth remodeling

Describe and explain the mechanism of tooth sprouting as well as the method of falling out of first teeth and replacing them with permanent ones. Understand the changes that take place under the influence of mechanical forces in individual structures of the suspensory apparatus of the teeth. Define the changes that occur over the years in individual dental tissues and understand the mechanisms of their formation and the possibility of recovery.

S22LP16 Oral Cavity

To define the peculiarities of the individual parts of the oral cavity - lip, tongue, palate.
(lip, tongue, filiform and vallate papillae)

S23LP17 Digestive Tube

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.
(esophagus, stomach, small intestine, large intestine, vermiform appendix)

S24LP18 Digestive Glands

To understand and explain the structure and function of intestinal glands. To understand and explain the flow of blood and bile inside the liver.
(salivary glands, liver, pancreas, gallbladder).

S25LP19 Skin

To clearly define the peculiarities of the histological structure of the skin. To memorized and explain the facts about the skin glands. To describe hair and nails. To differentiate 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)

S26LP20 Eye

To define the peculiarities of the histological structure of the individual structures of the eye. To describe and explain the texture and function of the lens, cilia muscle, and individual parts of the retina.
(cornea, iris, ciliary body, lens, retina)

S27LP21 Ear

To define the histological structure of various parts of the external, middle, and internal ear. To describe the function of individual parts of the internal ear.
(auricle, inner ear)

S28LP22 Urinary system

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.
(kidney, ureters, bladder)

S29LP23 Respiratory System
To define the basics 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)

S30LP24 Repetition, consultation

Students' 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.
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 2022/2023 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	16
	Midterm exam II	16
	Midterm exam III	16
	Total	48
Seminars, Laboratory practicals	Active participation/short written exams Completed practicals and an accepted written report	7
Tissue section recognition		15
TOTAL		70
	Oral exam	30

	Total	30
TOTAL		100

Written midterm exams

During the semester, tree written midterm exams are planned that will include the content of lectures, seminars, and laboratory practicals. At each midterm exam, the maximum of grade points that a student can obtain is 16.

All written midterm exams consist of 40 multiple-choice questions and are evaluated according to the criteria shown in Table 2.

MT I – 24.04.2023.

MT II – 08.05.2023.

MT III – 23.05.2023.

Table 2. Evaluation of written midterm exams I-III

No. of correctly answered questions	Grade points/credits
17 – 19	5
20 – 22	8
23 – 26	10
27 – 30	12
31 – 34	14
35 – 37	15
38 – 40	16

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-III will be held after completing regular classes in terms set by the course schedule, before final exams (24.05.2023.)

Seminars and laboratory practicals

A student can obtain 7credits throughout seminars and laboratory practicals. 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.

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 8 of the 10 microscopic slides, as well as the structures that are described (and drawn) during the laboratory practicals, and can receive a maximum of 15 points. At least 8 points are required for passing the exam. Each slide is evaluated with ½, 1, or 1 ½ 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 8 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 8 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

Final exam dates

26/05/2023, 21/06/2023, 05/07/2023
05/09/2023, 19/09/2023

Other important information regarding to 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 MsTeams.
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 2022/2023)

Date	Lectures (time and place)	Seminars / Practicals (time and place)	Instructor
1st week 10/04/2023		Holiday	
11/04/2023	L1, 2 (9:15 – 11:00) P3		Prof.dr.sc. E. Pernjak Pugel
12/04/2023		S1LP1 (12:30 – 14:45) Dept. Histology	Prof. dr.sc. T.Lenac Roviš
	L3, 4, 5 (15:15 – 17:30) Dept. Histology/Merlin		Prof.dr.sc. J.Tomac Prof.dr.sc. E. Pernjak Pugel
13/04/2023	L6, 7 (16:00 – 17:30) Dept. Histology/Merlin		Prof.dr.sc. E. Pernjak Pugel Prof.dr.sc. J.Tomac
14/04/2023		S2LP2 (8:30– 10:45) Dept. Histology	Prof.dr.sc. E. Pernjak Pugel
		S3LP3 (11:15– 13:00) Dept. Histology	Prof.dr.sc. J.Tomac
2nd week 17/04/2023	L8, 9, 10 (8:30 – 11:00) Dept. Histology/Merlin		Prof.dr.sc. J.Tomac Prof.dr.sc. E. Pernjak Pugel
		S4LP4 (13:15– 14:45) Dept. Histology	Prof.dr.sc. J.Tomac
18/04/2023		S5LP5 (10:15– 13:15) Dept. Histology	Prof.dr.sc. E. Pernjak Pugel
	L11, 12 (15:30 – 17:00)		Prof.dr.sc. J.Tomac

	Dept. Histology/Merlin		
19/04/2023		S6, S7 (12:15– 15:15) Dept. Histology	Prof.dr.sc. E. Pernjak Pugel Prof.dr.sc. J.Tomac
20/04/2023	L13,14 (16:00 – 17:30) Dept. Histology/Merlin		Prof.dr.sc. E. Pernjak Pugel
21/04/2023		S8LP6 (8:30– 10:45) Dept. Histology	Prof.dr.sc. J.Tomac
		S9LP7 (11:15– 13:30) Dept. Histology	Prof.dr.sc. E. Pernjak Pugel
	L15,16,17 (14:00 – 16:15) Dept. Histology/Merlin		Prof.dr.sc. J.Tomac Prof.dr.sc. E. Pernjak Pugel
3rd week 24/04/2023		MIDTERM I (8:30 – 9:30) Dept. Histology	
		S10LP8 (10:00– 11:30) Dept. Histology	Prof.dr.sc. J.Tomac
		S11LP9 (12:00– 13:30) Dept. Histology	Prof.dr.sc. E. Pernjak Pugel
	L18,19 (14:00 – 15:30) Dept. Histology/Merlin		Prof.dr.sc. J.Tomac
25/04/2023		S12LP10 (13:30– 15:45) Dept. Histology	Prof.dr.sc. E. Pernjak Pugel
26/04/2023		S13LP11 (12:15– 14:30) Dept. Histology	Prof.dr.sc. J.Tomac
	L20,21 (15:00 – 16:30) Dept. Histology/Merlin		Prof.dr.sc. E. Pernjak Pugel
27/04/2023	L 22, 23, 24, 25 (12:15 – 15:30) Dept. Histology/Merlin		Prof.dr.sc. J.Tomac
28/04/2023		S14 (8:30 – 10:45) Dept. Histology	Prof.dr.sc. E. Pernjak Pugel
		S15LP12 (11:15 – 13:00)	Prof.dr.sc. J.Tomac

		Dept. Histology	
	L 26, 27,28 (13:30 – 15:45) Dept. Histology/Merlin		Prof.dr.sc. E. Pernjak Pugel
4th week 01/05/2023		**Holiday**	
02/05/2023		S16 (11:30 – 13:00) Dept. Histology	Prof.dr.sc. J.Tomac
03/05/2023		S17LP13 (12:15 – 13:45) Dept. Histology	Prof.dr.sc. E. Pernjak Pugel
		S18LP14 (14:15 – 16:30) Dept. Histology	Prof.dr.sc. J.Tomac
04/05/2023		S19 (12:15 – 15:15) Dept. Histology	Prof.dr.sc. J.Tomac
05/05/2023		S20LP15 (8:30 – 10:00) Dept. Histology	Prof.dr.sc. E. Pernjak Pugel
		S21 (10:30 – 11:15) Dept. Histology	Prof.dr.sc. J.Tomac
	L29,30,31 (11:30 – 14:00) Dept. Histology/Merlin		Prof.dr.sc. J.Tomac
5th week 08/05/2023		MIDTERM II (8:30 – 9:30) Dept. Histology	
		S22LP16 (10:00– 11:30) Dept. Histology	Prof.dr.sc. E. Pernjak Pugel
		S23LP17 (12:00– 14:15) Dept. Histology	Prof.dr.sc. J.Tomac
	L32,33 (14:30 – 16:00) Dept. Histology/Merlin		Prof.dr.sc. E. Pernjak Pugel
09/05/2023		S24LP18 (10:15– 11:45) Dept. Histology	Prof.dr.sc. J.Tomac
	L34 (12:15 – 13:00) Dept. Histology/Merlin		Prof.dr.sc. E. Pernjak Pugel
10/05/2023		S25LP19 (12:15– 14:30)	Prof.dr.sc. E. Pernjak Pugel

		Dept. Histology	
11/05/2023	L35, 36 (12:15 – 14:00) Dept. Histology/Merlin		Prof.dr.sc. J.Tomac
12/05/2023		S26LP20 (8:30 – 10:45) Dept. Histology	Prof.dr.sc. E. Pernjak Pugel
		S27LP21 (11:15 – 12:45) Dept. Histology	Prof.dr.sc. J.Tomac
	L37,38 (13:15 – 15:00) Dept. Histology/Merlin		Prof.dr.sc. E. Pernjak Pugel
6th week 15/05/2023	L39, 40 (8:30 – 10:30) Dept. Histology/Merlin		Prof.dr.sc. E. Pernjak Pugel
16/05/2023		S28LP22 (08:30– 10:00) Dept. Histology	Prof.dr.sc. J.Tomac
17/05/2023		S29LP23 (8:30– 10:00) Dept. Histology	Prof.dr.sc. E. Pernjak Pugel
		LP24 (10:30 – 13:00) Dept. Histology	Prof.dr.sc. J.Tomac
18/05/2023		LP24 (12:30 – 15:00) Dept. Histology	Prof.dr.sc. E. Pernjak Pugel
19/05/2023		TISSUE RECOGNITION TEST (10:30 – 13:00) Dept. Histology	
7th week 22/05/2023		S30 (10:15– 12:00) Dept. Histology	Prof.dr.sc. E. Pernjak Pugel
23/05/2023		MIDTERM III (10:15– 12:00) Dept. Histology	
24/05/2023			
25/05/2023			
26/05/2023		FINAL EXAM Dept. Histology	

List of lectures and seminars:

	LECTURES (Topics)	Teaching hours	Location/Lecture room
L1	Importance of Histology in Understanding Human Tissue Formation and Function	1	P3
L2	Epithelial Tissue	1	P3
L3-4	Connective Tissue, Blood	2	Department of Histology and Embryology / Merlin
L5	Cartilage	1	Department of Histology and Embryology / Merlin
L6	Joints, TMJ	1	Department of Histology and Embryology / Merlin
L7	Immune System	1	Department of Histology and Embryology / Merlin
L8-9	Bone, Osteogenesis, Bone marrow	2	Department of Histology and Embryology / Merlin
L10	Introduction to tooth structure	1	Department of Histology and Embryology / Merlin
L11-12	Muscle Tissue, Circulatory System	2	Department of Histology and Embryology / Merlin
L13-14	Nerve Tissue, Nervous System	2	Department of Histology and Embryology / Merlin
L15	Endocrine System	1	Department of Histology and Embryology / Merlin
L16-17	Male Reproductive System, Gametogenesis	2	Department of Histology and Embryology / Merlin
L18-19	Female Reproductive System, Sex Cycles	2	Department of Histology and Embryology / Merlin
L20-25	Embryology – Fertilization, Implantation Second Week, Embryonic Period, Fetus, Body Cavities, Placenta	6	Department of Histology and Embryology / Merlin
L26-28	Digestive tract	3	Department of Histology and Embryology / Merlin
L29-31	Important facts about tooth structure and development	3	Department of Histology and Embryology / Merlin

L32-33	Digestive glands	2	Department of Histology and Embryology / Merlin
L34	Skin and Derivates	1	Department of Histology and Embryology / Merlin
L35	Eye	1	Department of Histology and Embryology / Merlin
L36	Ear	1	Department of Histology and Embryology / Merlin
L37	Respiratory System	1	Department of Histology and Embryology / Merlin
L38	Urinary system	1	Department of Histology and Embryology / Merlin
L39-40	Birth Defects, Teratology	2	Department of Histology and Embryology / Merlin
	TOTAL TEACHING HOURS	40	

	SEMINARS (Topics)	Teaching hours	Location/Lecture room
S1	Histology and its Methods of Study	1	Department of Histology and Embryology
S2	Epithelial Tissue	1	Department of Histology and Embryology
S3	Connective Tissue, Blood	1	Department of Histology and Embryology
S4	Cartilage, mineralized tissues	1	Department of Histology and Embryology
S5	Bone, Osteogenesis, Bone Marrow	2	Department of Histology and Embryology
S6	Dentine-pulpal complex	2	Department of Histology and Embryology
S7	Enamel	2	Department of Histology and Embryology
S8	Muscle Tissue, Circulatory System	1	Department of Histology and Embryology
S9	Nerve Tissue, Nervous System	1	Department of Histology and Embryology
S10	Immune System	1	Department of Histology and Embryology
S11	Endocrine System	1	Department of Histology and Embryology
S12	Male Reproductive System, Gametogenesis	1	Department of Histology and Embryology

S13	Female Reproductive System	1	Department of Histology and Embryology
S14	Embryology	3	Department of Histology and Embryology
S15	Embryology	1	Department of Histology and Embryology
S16	Head and neck development	2	Department of Histology and Embryology
S17	Tooth structure	1	Department of Histology and Embryology
S18	Tooth development	1	Department of Histology and Embryology
S19	Amelogenesis, dentinogenesis	4	Department of Histology and Embryology
S20	Paradont, cementum	1	Department of Histology and Embryology
S21	Tooth eruption, remodeling	1	Department of Histology and Embryology
S22	Oral Cavity	1	Department of Histology and Embryology
S23	Digestive tube	1	Department of Histology and Embryology
S24	Digestive Glands	1	Department of Histology and Embryology
S25	Skin	1	Department of Histology and Embryology
S26	Eye	1	Department of Histology and Embryology
S27	Ear	1	Department of Histology and Embryology
S28	Urinary System	1	Department of Histology and Embryology
S29	Respiratory System	1	Department of Histology and Embryology
S30	Consultations	2	
	TOTAL TEACHING HOURS	40	

	LABORATORY PRACTICALS (topics)	Teaching hours	Location/Lecture room
LP1	Methods in Histology	2	Department of Histology and Embryology
LP2	Epithelial Tissue	2	Department of Histology and Embryology
LP3	Connective Tissue, Blood	1	Department of Histology and Embryology
LP4	Cartilage	1	Department of Histology and Embryology
LP5	Bone, Osteogenesis, Bone marrow	2	Department of Histology and Embryology

LP6	Muscle Tissue, Cardiovascular System	2	Department of Histology and Embryology
LP7	Nervous Tissue	2	Department of Histology and Embryology
LP8	Immune System	1	Department of Histology and Embryology
LP9	Endocrine System	1	Department of Histology and Embryology
LP10	Male Reproductive System	2	Department of Histology and Embryology
LP11	Female Reproductive System	2	Department of Histology and Embryology
LP12	Embryology	1	Department of Histology and Embryology
LP13	Tooth structure	1	Department of Histology and Embryology
LP14	Tooth development	2	Department of Histology and Embryology
LP15	Paradont, cementum	1	Department of Histology and Embryology
LP16	Oral Cavity	1	Department of Histology and Embryology
LP17	Digestive System	2	Department of Histology and Embryology
LP18	Digestive Glands	1	Department of Histology and Embryology
LP19	Skin	2	Department of Histology and Embryology
LP20	Eye	2	Department of Histology and Embryology
LP21	Ear	1	Department of Histology and Embryology
LP22	Urinary System	1	Department of Histology and Embryology
LP23	Respiratory System	1	Department of Histology and Embryology
LP24	Histology slide repetition	6	Department of Histology and Embryology
	TOTAL TEACHING HOURS	40	

	FINAL EXAM DATES
1.	26/05/2023
2.	21/06/2023
3.	06/07/2023
4.	05/09/2023
5.	19/09/2023