UNIVERSITÀ DEGLI STUDI DI BARI ALDO MORO

COURSE OF STUDY *MEDICINA e CHIRURGIA*

ACADEMIC YEAR *2024-2025*

INTEGRATED COURSE: *HIUMAN ISTOLOGY AND EMBRYOLOGY*

ACADEMIC SUBJECT: - H*ISTOLOGY (4CFU)*

- EMBRYOLOGY (3CFU)

- CYTOLOGY (1CFU)

CANALE AK

Main information about teaching	
Course year	*I year*
Delivery period	*II semester*
University credits (CFU/ETCS):	*9 CFU*
SSD	*BIO/17*
Language	*italian*
Mode of attendance	*mandatory*

Teacher	*Cytology and Embryology*
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Head office	*Istituto di Anatomia Umana ed Istologia "Rodolfo Amprino"*
Virtual office	
Reception	*Tuesday 13:00 – 14:00*
Teacher	*Histology*
First and Last Name	*Daniela Virgintino*
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Phone	
Head office	*Istituto di Anatomia Umana ed Istologia "Rodolfo Amprino"*
Virtual office	
Reception	*Tuesday 13:00 – 14:00*

Organization of teaching			
Hours			
Total	Frontal teaching	Practice (lab, field, exercise, other)	
90	*80*	*10*	
CFU/ETCS			
9	*8*	*1*	

Learning objectives	***CYTOLOGY*** *The student should acquire the ability to understand the morphological organization of eukaryotic cells and subcellular structures, their genesis and their interrelationships. Special emphasis will be given to membrane specializations and the junction devices both between cells and between cells and the extracellular matrix. This will enable an understanding of how cells can, by assuming specific forms and functions, peculiarly characterize various tissues.* ***HISTOLOGY*** *The student should acquire the ability to understand the structural and ultrastructural organization of human tissues and the mechanisms of tissue histogenesis and regeneration. He/she will also need to understand the basis of tissue formation and development from the regulation of stem cell proliferation and self-maintenance processes. It will be essential to know how to recognize the specific morphological characteristics of different tissues, the cells that are part of them, and the supramolecular arrangements of the extracellular matrix by being*

	able to correlate them with the anatomical and functional aspects that oversee their integrity and inter-tissue integration in the composition of different organs. In addition to mastering the correct histological classifications and in the 'morpho-functional interpretation of tissues, the knowledge attained must also include the specific repair, renewal and aging properties of each tissue, fundamental prerequisite elements for the understanding of principles and applications of regenerative medicine. *Finally, the student should know how to analyze the structural organization of histological (normal) preparations obtained by histochemical and immunohistochemical techniques in light microscopy and be able to recognize ultrastructural features in images of electron microscopy preparations.* ***EMBRIOLOGY*** *The student should acquire basic knowledge about the germ cell maturation patterns and their characteristics, the biological processes underlying fertilization, cell differentiation, and the morpho-dynamic events chronologically related to human embryonic/fetal development. This will provide an understanding of the formation of the final anatomical arrangement of the human body, as well as the mechanisms associated with the occurrence of congenital malformations in the various organs and systems. The student should also know structure, mode of maturation of embryonic adnexa in order to understand their functional significance, physiological implications and physio-pathological aspects related to pregnancy and different in vitro fertilization procedures.*

Expected learning outcomes	*At the end of this course, students should demonstrate that they 1) know the structure and functions of tissues, as well as the functional relationships among different cells; 2) know the molecular mechanisms that regulate proliferation, differentiation, and cell death; 3) know how to identify cells and tissues in histological preparations; and 4) know the regulatory mechanisms of gametogenesis, fertilization and embryonic development.*
DD1 Knowledge skills	***Knowledge and Ability to Understand:*** *The student is expected to demonstrate mastery of basic knowledge related to the morphological characteristics of cells and extracellular matrices of various tissues and to describe them in histology preparations.*
DD2 Applied knowledge and understanding skills	***Applied knowledge and comprehension skills:*** *The student must acquire the ability (1) to recognize in histological preparations, obtained by light and electron microscopy, Epithelial, Connective, Muscular, Nervous tissues and the corpuscular elements of Blood and (2) to describe their structural and ultrastructural characteristics.*
DD3-5 Transversal skills	***Autonomy of judgment:*** *The student should have acquired enough knowledge to enable him or her to recognize the strengths of microscopic analysis and the critical issues related to sample preparation processes.* ***Communication skills:*** *The student should have the ability to relate in a professional and competent manner to possible interlocutors. The student should have the ability to convey the knowledge acquired in a clear and understandable manner.* ***Ability to learn:*** *The student should be able to examine and understand scientific texts in such a way as to employ them in everyday professional and research contexts. Finally, the*

	student should show possession of the ability to use the concepts and knowledge acquired by demonstrating reasoning according to the specific logic of the discipline.
Teaching content (Program)	***CYTOLOGY (1 CFU)*** ***1.*** *Shape, size and general characteristics of the eukaryotic cell.* *2. Cell membrane: fluid mosaic model, glycocalyx, functions.* *3. Cytoplasm: morphology and functions of cytoplasmic organelles.* *4. Granular endoplasmic reticulum; agranular endoplasmic reticulum; ribosomes; Golgi apparatus; lysosomes; mitochondria; cytoskeleton; mitotic apparatus; included. Nucleus: shape, size, location and number. Morphology and functions of the interphase nucleus: nuclear envelope, chromatin, nucleolus.* *5. Cytoskeleton.* *6. Specializations of the apical membrane domain: microvilli, cilia, stereocilia. Cell-cell and cell-matrix junctional systems.* *7. Eukaryotic exocytosis and endocytosis.* ***HISTOLOGY (4 CFU)*** *Topographic staining; methods of impregnation with heavy metal salts; methods for elastic fibers.* *Cytochemical and histochemical methods for the detection of carbohydrates, proteins, nucleic acids and lipids.* *Immunocytochemistry and immunohistochemistry: immunoenzymatic and immunofluorescence methods.* *General principles of histodifferentiation.* *Stem cell and cell populations.* *Tissue organization: hollow organs and filled organs, general structure.* *1. EPITHELIAL TISSUES* *A) The lining epithelia: classification criteria. Locations, structure and functional aspects of the various types of epithelia (simple squamous, simple cubic, simple prismatic, pseudostratified prismatic, stratified squamous, stratified prismatic, urothelium). Insights into: Epidermis (own cells, specialized cells, corneal cytomorphosis); epithelia of respiratory, gastrointestinal, urogenital systems. Basal membrane.* *(B) Glandular epithelia. The exocrine glands: histogenesis, classification criteria and secretion modes. Tubular, acinar, alveolar, tubulo-acinar and tubulo-alveolar glands. Simple, branched, compound glands. Examples of simple tubular, branched acinose, branched and compound tubulo-acinar, branched and compound tubulo- alveolar glands. Endocrine glands: histogenesis, classification criteria and functional aspects of endocrine secretion* *2. CONNECTIVE TISSUES.* *Classification and general functional aspects. Connective cell's structure and ultrastructure. The extracellular matrix: collagenous, reticular, elastic fibers (molecular organization and ultrastructure) and fundamental or amorphous substance. The Connective tissue proper: the mature mucosal connective tissue; the reticular connective tissue; the loose fibrillar connective tissue; the adipose tissue; the dense connective tissue with interwoven bundles. The specialized Connective Tissues: fibrous tissue; elastic tissue; cartilaginous tissues (hyaline, elastic and fibrous cartilage); lamellar bone tissue and non-lamellar bone tissue. Intramembranous ossification and endochondral ossification. Bone remodeling.* *3. BLOOD* *Generalities on the composition of blood. Structure and function of red blood cells, white blood cells, platelets.* *4. MUSCLE TISSUES.*

	Classification of muscle tissues. Skeletal striated muscle tissue. Cardiac striated muscle tissue (contraction and conduction myocardium). The smooth muscle tissue. The morphological basis of muscle contraction. *5. NERVOUS TISSUE.* *Generalities on Central Nervous System and Peripheral Nervous System.* *The neuron: morphological classification and hints of functional classification. Structure and ultrastructure of the neuronal body and its extensions. The nerve fiber; classification of nerve fibers and their structure and ultrastructure. The synapse. The somatic (motor plate) and visceral neuromuscular junction. Neuroglia: classification of central and peripheral nervous system neuroglia and hints of functional classification. Main structural and ultrastructural features of neuroglia cells. The blood-brain barrier.* ***EMBRYOLOGY (3 CFU)*** *1. Development and structure of the male and female genital apparatus.* *2. Male gametogenesis.* *3. Structure and function of Sertoli and Leydig cells.* *4. Female gametogenesis.* *5. Ovarian cycle.* *6. Menstrual cycle.* *7. Fertilization.* *8. Segmentation.* *9. Nesting.* *10. Bilaminar embryonic disc development.* *11. Gastrulation and development of the trilaminar embryonic disc up to the establishment of the primitive organ sketches.* *12. Derivatives of the embryonic leaflets.* *13. Folding and delimitation of the embryo.* *14. Primary and secondary neurulation, neuro-histogenesis, development of encephalic vesicles.* *15. Development and divisions of the primitive gut.* *16. Formation, development, and fate of adnexa in the human species: yolk sac, allantois, amnion, chorion, placenta, umbilical cord.* *17. Development of branchial arches and derivatives.* *18. Major events in the development of the heart.* *19. Fetal circulation and its changes at birth.* ***Professionalizing activity (1 CFU)*** *The student should know the methods of investigation in histology:* *1. Topographic, cytochemical and histochemical staining.* *2. Methods of impregnation with heavy metal salts.* *3. Immunocytochemistry and immunohistochemistry: immune-enzymatic methods and immunofluorescence methods.* *The student should know the means of investigation in histology:* *4. Compound transmitted light microscope (bright field).* *5. Confocal laser microscope.* *6. Transmission and scanning electron microscope.*
Reference texts	*CYTOLOGY HISTOLOGY* *Adamo et al, "Histology by V. Monesi," Piccin* *Ross M.H., Pawlina W. "Histology," Ambrosian Publishing House* *Maraldi, Tacchetti "Medical biology-cytology," edi-Ermes* *Maraldi, Tacchetti "Medical Histology," edi-Ermes*

	EMBRIOLOGY *Langmann, "Medical Embryology," Masson* *Schoenwolf et al, "Larsen human embryology," edra* *De Felici et al, "Human Embryology," Piccin* *TEXTS-ATLAS OF HISTOLOGY AND MICROSCOPIC ANATOMY* *Wheater, "Histology and Microscopic Anatomy," Ambrosian Publishing House Ross M.H., Pawlina W. "Atlas of Histology and Microscopic Anatomy," Ambrosian Publishing House* *Stevens A.-Lowe J., "Human Histology," Ambrosian Publishing House*

Rating	
Modalities of learning verification	*The examination is conducted in written and oral form on the entire Histology and Embryology program and includes testing of skills in recognition and analysis of histological preparations by virtual microscopy.*
Criteria for assessment of learning and assignment of final grade	*The grade is given in thirtieths and the minimum sufficient is 18/30.*