

Ponce Health Sciences University
Master of Science in Medical Science

COURSE INFORMATION

Program: Medicine

Course Title: Histology

Course Numbers(s): ANO6051

Term: Trimester

Time Requirement: (4 hours/week)

Modality: Online

Credits: 4

Additional Course Activities: (hours/week)

Activity	Hrs/wk
Self-Directed Learning	10
In-Class Sessions	10
Virtual Labs	5
Exam Prep	10
Total	35

Co-requisites: Medical Ethics, Health Disparities

Faculty:

Lead Faculty: Dr. Shannon Green

Office Hours: By appointment

Faculty Assisting: Dr. Ferrahs Abdelbaset

Contact Information: Canvas Message

Office Location: Virtual

Teaching Assistant: Samantha Kos

Program Coordinator: Dr. Ferrahs Abdelbaset

Acknowledgements:

The materials in this course were developed at Ponce Health Sciences University (PHSU) by Dr. Lynnette A. Ruiz and Dr. Fernando Rodriguez-Rodriguez, and they recorded the Spanish versions of the lecture videos. Dr. Luis Vidal recorded the English versions of the lecture videos.

COURSE PURPOSE

Course Description: Study of the many different aspects of the internal structure of cells, tissues, and organs in the human body, presenting a comprehensive survey of many of their complex interrelationships.

STUDENT LEARNING OBJECTIVES AND OUTCOMES

General Objectives:

1. Describe the structure and function of cells and their various components as well as their products.
2. Describe the four main tissues of the body with an emphasis on how cells specialize to perform specific functions.
3. Describe the different basic structure and function of organ systems, including their components.
4. To understand the function of organ systems students must have a thorough knowledge of their component tissues and their origin. To understand tissues, a general knowledge of its cells is absolutely necessary. For this reason, one of the objectives of the course is to describe the various organ systems including components, function, and basic structure of the cells. This knowledge will serve to recognize healthy tissues and organs. The course begins with the study of the cell, then types of tissue, and finally normal tissues as found in every organ. Clinical correlations related to symptoms, photomicrographs of diseased tissues or organs, short histopathological descriptions, and diagnostics labs of specific diseases are presented. Another objective is to describe the most common conditions related to each topic. Detailed study of tissues, cells, and cell components will be carried out with the help of light and electron micrograph images.

Specific Objectives:

1 Introduction and Tissue Preparation

- Define the term histology and its relevance with other basic sciences. Structural levels: cell, tissue, organ, organ system, organism (body).
- Explain some of the methods used for preparation and observation of tissues and cells under microscopic examination. Tissue preparation: fresh tissue, whole mount, smear, stained sections.
- Explain the chemical basis for histologic staining. Stains: acid-base (hematoxylin and eosin, H & E), trichrome, silver stains, lipid stains, metachromasia, histochemical stains (periodic acid - Schiff's or PAS stain), tracers (radioisotopes, immunochemistry), others.
- Name some of the most commonly used histochemical techniques in the identification of cells components (include immunochemistry techniques). Basic parts of the cells (briefly): nucleus and cytoplasm.

2 The Cell I and Organelles

- Describe the morphologic features of a cell membrane and the theories (structural interpretations). Cell membrane: function, composition characterization, structural interpretation, methods of transport across the cell membrane, membrane modifications.
- List the various methods of transport in and out of cells.

3 The Cell II and the Cell III

- Describe the structural components and functions of the cell nucleus: Nucleus: occurrence, function, structure, methods for getting in or out of it.
- Describe the various stages in the cell cycle. Cell cycle: interphase and mitosis.
- Define the terms cytokinesis and karyokinesis.
- Describe the morphologic features and structural components of the cytoskeleton.
- Describe terms for abnormal cells and tissues.

4 Epithelial Tissue

- Define the term epithelium.
- List major functions of epithelial tissue. Classification: cell shape and number of cell layers.
- Describe the main types of epithelial tissue and their various subclassifications: Epithelial tissues: simple squamous; simple cuboidal; simple columnar; pseudostratified columnar; stratified squamous; stratified cuboidal; transitional.
- Explain how cells are attached to a basement membrane and to their neighboring cells.
- Describe cell surface modifications. Cells modifications (polarity): apical surface: microvilli, cilia, flagellum, stereocilia; lateral surface: zonula occludens, zonula adherens, macula adherens, gap junction; basal surface: basal lamina (basement membrane), hemidesmosomes, basal infolding, sodium potassium ATPase.
- Define the classification of the glandular epithelium: types of glands, structure, secretory cells, types and mechanism of cell secretions: endocrine and exocrine glands.

5 Connective Tissue

- List major functions of connective tissue.
- Name general characteristics and components of connective tissue: Extracellular material or matrix - collagen, elastic and reticular fibers (microscopic morphology, biochemical components and specific functions) & ground substance (biochemical components and functions) Cells: mesenchymal cell, fibroblast, macrophage, mast cell, plasma cell, adipose cell, leukocytes.
- List the main types of connective tissue and their specific functions: Loose CT - areolar (ordinary); lamina propria; reticular tissue; serosa; adipose tissue (yellow and brown fat); hematopoietic tissue; Dense CT - dense irregular tissue; dense regular tissue (collagenous & elastic); Supporting CT - cartilage & bone.
- Describe the general histophysiology of connective tissue.

6 Integumentary System

- List major functions of integumentary system.
- Name the characteristic features of the epidermis and dermis, and the junctions between them.
- Describe each epidermal layer. Parenchymal cells - keratinocytes, stratum basale (germinativum), stratum spinosum, stratum granulosum, stratum lucidum, stratum corneum.
- Describe the special epidermal cells. Special epidermal cells: melanocyte, Merkel cell and Langerhans cell.
- List the cellular and intercellular components of the dermis and their relationship to the epidermis and hypodermis: papillary and reticular layers.
- Describe the hypodermis.
- Describe the differences between thick and thin skin.
- Describe the sensory structures of the skin: the free nerve endings; encapsulated nerve endings (Meissner's and Pacinian corpuscles).
- Describe the general structure and components of a hair follicle, sebaceous gland and sweat gland: Hair follicle: layers, hair bulb, arrector pili muscle, sebaceous gland; Skin glands: mammary glands, ceruminous gland, sebaceous gland, eccrine and apocrine sweat glands.
- Describe the differences between the eccrine and apocrine secretion.

7 Cartilage

- Describe the cells responsible for the formation and maintenance of cartilage: Cartilage formation or growth: appositional and interstitial mechanism; chondrocytes, chondroblast.
- Describe the detailed morphology and general characteristics of the intercellular components of cartilage: fibers (collagen type I, collagen type II and elastic fibers).
- List the morphology and functions of the three types of cartilage; mechanisms of growth: hyaline, elastic and fibroelastic cartilages.
- Relate cartilage function to cartilage morphology.

8 Bone and Bone Formation

- List the main function of bone, and its general characteristics.
- Describe the macroscopic and microscopic structures of long and flat bones: compact & spongy bones; diaphysis, metaphysis, epiphysis, periosteum, endosteum; osteon, Volkmann's canal, outer and inner circumferential lamellae, interstitial lamellae, cement lines, spicules or trabeculae.
- Describe the intracellular bone matrix: organic components and minerals.
- List and describe the cells located in bone tissue: osteocytes, osteoblast, osteoclast.

9 Muscle

- Name the functions, types, general characteristics and terminology related to muscular tissue.
- Describe the histologic organization of skeletal muscle: CT components - epimysium, perimysium, endomysium; Organization of the muscle fiber (myofibrils), Organization of myofilaments in a myofibril - sarcomere, actin and myosin filaments, I band, Z line, A band, H band, M line, desmin, T-system and Sarcoplasmic Reticulum (SR) - Triad control of contraction and coordination - motor nerve (neuromuscular junction - motor end plate, sensory nerve) - neuromuscular spindle; regeneration: satellite cells of cardiac muscle: diad, intercalated disc of cardiac muscle, myoepithelial cells; smooth muscle cells.

10 Blood

- Name the general functions of blood.
- Describe the morphology, general characteristics and specific functions of the formed elements of the blood: erythrocytes, polymorphonuclear neutrophilic leukocytes, eosinophilic leukocytes, basophilic leukocytes, lymphocytes, monocytes and blood platelets.
- Outline the composition of plasma: water, inorganic salts, organic compounds (plasma proteins). Terminology related: hematocrit, differential cell count, blood volume, serum.

11 Cardiovascular System

- List the major functions and the structural components of the cardiovascular system.
- Describe in detail the histology of different types of arteries and veins: General plan of vessels: tunica intima, tunica media, and tunica adventitia.
- Describe the histologic characteristics of the various types of capillaries, including location: **Blood Capillaries:** continuous, fenestrated with diaphragms, fenestrated without diaphragms, sinusoids; functional aspects. **Arteries:** arterioles, muscular arteries, elastic arteries; **Veins:** venules, veins, large veins.
- Describe the histologic characteristics of the lymphatic system: lymphatic capillaries, lymphatic vessels, lymphatic ducts.
- Describe the histologic detail of the heart: endocardium, myocardium, epicardium, heart skeleton, valves, and specific functions.

12 Respiratory System

- List the general functions and structural plan of the RS: mucosa, submucosa, and adventitia (respiratory and olfactory epithelium).
- Describe the structures which make up the conducting and respiratory portions. Conducting portion: Nasal cavities - vestibule, respiratory and olfactory regions; pharynx, nasopharynx, oropharynx; larynx - vocalis muscle, true and false vocal cords, cartilages, epiglottis; trachea - "C-shaped" hyaline cartilage; LUNGS: bronchus, bronchiole, terminal bronchioles; Respiratory portion (LUNGS): respiratory bronchiole, alveolar ducts, alveolar sacs, alveoli.
- List the different types of epithelium found in the respiratory tract from nose to alveoli.
- Explain the differences between a bronchi and a bronchiole.
- Describe and locate the smooth muscle found in the lamina propria from the trachea to the terminal bronchioles.

- Describe the elastic tissue found between the mucosa and submucosa from the trachea to the terminal bronchioles.
- Describe the detailed histology of the alveolus and the blood-air barrier. ALVEOLI - interalveolar septum, interstitium, pores of Kohn, dust cells, alveolar lining cells (Type I and II pneumocytes), surfactant, desmosomes and tight junction (zonula occludens), blood-air barrier, regeneration properties.
- Describe the vascular and lymphatic supply of the lungs.
- Describe the pleura: parietal and visceral layers.

13 Lymphatic System

- List the functions of the Lymphatic System.
- Identify different types of lymphatic tissues: diffuse lymphatic tissue, lo and Ilo solitary lymphatic nodules (follicles), aggregations of nodules, GALT (Gut Associated Lymphatic Tissue), MALT (Mucosa Associated Lymphatic Tissue).
- Describe the histologic structures of lymphatic organs: tonsils (palatine, pharyngeal and lingual tonsils), lymph node, spleen (include blood flow), thymus.
- Explain the specific functions, components (stroma & parenchyma), histologic organization, and the histophysiology of the lymphatic organs.

14 Gastrointestinal System

- List the major functions of the GI system.
- Describe the histology and morphologic structure of the tongue: ventral side and dorsal side (papillae and taste buds).
- Name basic differences of the tongue papillae: fungiform, filiform, foliate and circumvallate.
- Describe the general morphologic plan of the GI system emphasizing on the similarities and differences in histology from esophagus to the anus.
- Describe the histologic structure of the esophagus: Esophagus: mucosa, submucosa, muscularis externa, outer CT.
- List the histologic details of the surface epithelium of the stomach, gastric pits, glands and their supporting tissues: Stomach: Parts - cardiac, fundic and pyloric stomach, Structure - mucosa, muscularis mucosa, rugae, muscularis externa, serosa.
- Summarize the physiology of the stomach in order to relate function to morphology.

- Describe the histologic structure of small intestine: duodenum, Brunner glands, jejunum, ileum, Peyer patches, Lieberkühn glands, Kerckring valves, goblet cells, absorptive cells, Paneth cells. Large intestine: goblet cells and absorptive cells.
- Describe the structures which permit the small intestine to absorb nutrients and fluids.
- Compare the kind of cells found in the mucous membrane of the small intestine and the large intestine.
- Distinguish the glands found in the mucosa and submucosa of the large intestine.
- List the general functions of the exocrine and endocrine portions of the liver.
- Describe the stroma of the liver.
- Describe the parenchyma of the liver. Parenchyma - hepatocytes, Kupffer cells, Ito cells; Structure (classical lobule) - portal triads, space of Disse, bile canaliculus, Blood flow.
- Summarize the circulation of blood and bile in the liver.
- Distinguish the different types of liver lobules: classical, portal and hepatic acinus lobules.
- Describe the structure of gallbladder in which the bile is stored and concentrated. Gallbladder: Structure - mucosa, muscularis externa, serosa or adventitia.
- Integrate the liver and gallbladder histology with its physiology.
- Describe the histologic structure and components of the salivary glands: Structure - stroma, cells (mucous and serous cells) and parotid duct, submandibular (submaxillary), sublingual, and many small (unnamed) scattered in the oral cavity.
- Outline the components and functions of saliva.
- List the general functions of the exocrine and endocrine portions of the pancreas.
- Describe the stroma and parenchyma of the pancreas: centroacinar cells.
- Explain the function and morphology of the islets of Langerhans: Beta cells, alpha cells.

15 Urinary System

- Describe in detail the histology of the tubular components of the kidney in which urine is formed.
- Describe the detailed histology of those parts of the kidney which are essential for supporting the function of the tubular components.

- Describe the vascular supply of the kidney and its role in the reabsorption of the great amount of fluid that is essentially filtered out of the blood.
- Describe the detailed histology of the ureter, urinary bladder and urethra which carry urine to the outside of the body

16 Endocrine System

- List the major functions: General characteristics: development, arrangements of cells, types of secretion, distribution, barriers to secretion, stroma.
- Differentiate between exocrine and endocrine gland.
- List general characteristics of an endocrine gland.
- Review the embryonic origin of the pituitary (hypophysis).
- Name the major divisions and sub-divisions of the pituitary: development, blood system (portal system), pars distalis (chromophils, chromophobes, hypothalamic control), pars tuberalis, pars intermedia (Rathke's pouch), pars nervosa (supraoptic and paraventricular nuclei, Herring bodies, pituicytes).
- Describe in detail the microscopic morphology of each division of the pituitary.
- Identify the origin of the neurosecretions of the pituitary.
- Describe in detail the blood supply of the pituitary and its relation to neurosecretions.
- Describe the histologic structure of the cortex and medulla of the suprarenal gland: blood supply, cortex (zona glomerulosa, zona fasciculata, zona reticularis; blood supply) medulla (chromaffin cells, sympathetic ganglion cells; nerve supply).
- Discuss the dual embryonic origin of the cortex and medulla of the suprarenal gland.
- Trace the blood of the cortex and medulla of the suprarenal gland.
- Describe the nerve supply of the medulla of the suprarenal gland.
- Describe the function and morphology of the paraganglia.
- Identify the microscopic morphology of the thyroid gland: organization (follicles), thyroid hormone (function, storage and release), calcitonin hormone (parafollicular cells; function).
- Discuss the storage and release of the thyroid hormone.
- Relate follicle cell morphology to the formation of thyroxine.
- Relate follicle cell morphology to the formation of thyrocalcitonin.

- Describe the stroma and parenchyma of the parathyroid glands: organization, chief and oxyphil cells, parathyroid hormone (function).
- Explain the role of parathyroid hormone in maintaining normal blood calcium levels: types and cells (open and closed cells).
- Describe characteristic features of the Diffuse Neuroendocrine System (DNS).

17 Male Reproductive System

- List the major functions of the male reproductive system.
- Outline the terminology and sequence of structures which make up the male reproductive system.
- Identify the histologic structure of the stroma and parenchyma of the testis: Compound tubular gland, CT covering - tunica vaginalis, tunica albuginea, mediastinum (fibrous septa), Seminiferous tubules - spermatogenesis, spermatogenesis, spermiogenesis; stratified epithelium.
- Describe the interstitial tissue of the testis: Leydig (interstitial) cells.
- Describe the histologic structures of the intratesticular and excretory genital ducts of the male reproductive system: Intratesticular genital ducts: tubuli recti, rete testis, efferent ducts (ductuli efferentes).
- Describe the successive stages of development spermatozoa: spermatogonia (type A and type B), First spermatocytes, Second spermatocytes, spermatids, Sertoli cells ("blood - testis barrier").
- Name the various stages of the spermatocytes.
- Describe the histologic of the accessory glands of the male reproductive system: seminal vesicles, prostate gland, bulbourethral (Cowper') glands.
- Describe the structure of the penis, with special of emphasis in the histologic aspects: Penis: corpora cavernosa, corpus spongiosum or corpus cavernosum urethrae, glans penis, tunica albuginea, erection (control), glands of Littre, skin.
- Describe the blood supply of the penis.

18 Female Reproductive System

- List the major functions of the female reproductive system.
- Describe the differences between the primordial, primary, secondary follicles, Graafian follicle.
- Distinguish the structure and functional differences between atretic follicles, corpus luteum, and corpus albicans.
- Describe the hormonal control of ovulation: FSH, LH, estrogen, progesterone.
- Describe the histology of the ovary, oviduct, uterus, vagina and vulva: Ovary: Cortex - germinal epithelium, tunica albuginea, stroma, follicles, ovulation, corpus luteum, corpus albicans, atretic follicles; Medulla - hilus cells; Oviducts (Uterine or Fallopian Tubes), Uterus: body (corpus), cervix, fundus; endometrium (menstrual cycle), myometrium, serosa or adventitia; Vagina: mucosa, muscularis externa, adventitia.
- Describe meiosis as it occurs during the primary and secondary oocytes stages: Prophase I, metaphase I, anaphase I, telophase I, secondary oocyte and first polar body, prophase II, metaphase II, anaphase II, telophase II, mature oocyte and two polar bodies, dormant phase: dictyotene and metaphase II.
- Describe the events leading to and following menstruation as they affect the uterine histology: menses, proliferative phase, secretory phase.
- List the changes that occur in both, the parenchyma and the stroma of the mammary glands in pregnancy.
- Correlate histologic changes of the mammary glands with hormonal changes.

19 Nervous System

- Describe the composition and function of different components of the neuron.
- Discuss the mechanisms of axonal transport.
- List the different types of neurons found within the nervous system.
- Explain the different types of neuroglia and their functions.
- Discuss the nature of myelin formation.
- Explain the composition of the peripheral nerve.
- Discuss the types of neuronal injury and the process of regeneration.

20 The Eye

- List the major functions of the eye.
- Describe the organization of the eye: Eye wall: Outer layer - cornea, sclera, limbus; Middle layer - choroid, ciliary body, ciliary processes, iris; Inner layer - retina, ora serrata, fovea centralis, macula lutea, optic nerve.
- Describe the histology of the retina and its role in vision: pigmented layer, rod and cones, bipolar layer, horizontal cells, amacrine cells, ganglion layer, plexiform layer, axonal layers.
- Describe the elements involved in light refraction: cornea, aqueous humor, lens, and vitreous body. Refraction media: cornea, lens (structure), vitreous body, aqueous humor.
- Describe the organization of the ciliary body and its role in production of aqueous humor.
- Describe the iris and the elements that regulate pupil size.
- Describe the histologic structure of the eyelids.

21 The Ear

- List the major functions of the ear.
- Describe the organization of the ear, its content and function. **External ear:** auricle, external auditory meatus (ear canal)-tympanic membrane. **Middle ear or tympanic cavity:** Mucous membrane, tympanic membrane, mastoid air cells, Eustachian (auditory) tube, oval window, round window, auditory ossicles (malleus, incus, stapes), tendons of the tensor tympani and stapedius muscles, chorda tympani nerve. **Inner ear:** Bony labyrinth - vestibule, semicircular canals, bony cochlea, Membranous labyrinth - utricle, saccule, semicircular ducts, cochlear duct (scala vestibuli, scala tympani, stria vascularis, organ of Corti). Crista ampullaris, cupula, hair cells, macula, otoconia, vestibular membrane, basilar membrane, tectorial membrane, helicotrema, modiolus, spiral ganglia, vestibular ganglia.
- Describe the organ of Corti and its role in auditory sensation.
- Describe the ampullae of the semicircular canals and their role in sensing angular acceleration.
- Describe the utricle and saccule and their role in sensing linear acceleration.

COURSE SCHEDULE

Week	Lecture	Lab	Reading	Assessment
1				
2	Cell Epithelium	Cell Epithelium	pg. 28-81 pg. 116-169	ICS Discussion Board Assignment Quiz
3	Connective Tissue Integumentary System	Connective Tissue Integumentary System	pg. 170-209 pg. 524-565	ICS Discussion Board Assignment Quiz
4	Cartilage Bone & Bone Formation	Cartilage Bone & Bone Formation	pg. 210-231 pg. 232-273	ICS Discussion Board Assignment Quiz
5	Muscle Blood Cardiovascular System	Muscle Blood Cardiovascular System	pg. 336-379 pg. 290-335 pg. 432-471	ICS Discussion Board Assignment Quiz
6				Exam 1
7	Respiratory System	Respiratory System	pg. 702-739	ICS Discussion Board Assignment Quiz
8	Lymphatic System	Lymphatic System	pg. 472-523	ICS Discussion Board Assignment Quiz
9	Gastrointestinal System	Gastrointestinal System	pg. 566-701	ICS Discussion Board Assignment Quiz
10	Urinary System	Urinary System	pg. 740-783	ICS Discussion Board Assignment Quiz
11				Exam 2
12	Endocrine System Male Reproductive System Female Reproductive System	Endocrine System Male Reproductive System Female Reproductive System	pg. 784-831 pg. 832-943	ICS Discussion Board Assignment Quiz
13	Nervous System The Eye The Ear	Nervous System The Eye The Ear	pg. 380-431 pg. 944-981 pg. 982-1007	ICS Discussion Board Assignment Quiz
14				Exam 3
15				

INSTRUCTIONAL MATERIALS

Required Text(s):

Histology A Text and Atlas

Ross, M. H and Pawlina W.

Seventh edition (2015) Lippincott Williams & Williams

Atlas of Histology with Functional Clinical Correlations

Dongmei Cui First Edition (2011)

Wolters Kluwer Lippincott Williams & Wilkins

Recommended Text(s):

Histology A Text and Atlas Ross.

M. H and Pawlina W. Sixth edition (2011)

Lippincott Williams & Williams

Atlas of Descriptive Histology

Ross, M. H., Pawlina, W., Barnash T. A. (2009)

Sinauer Associates, Inc. Publisher

Visual Histology DVD Series

Moran, D.T. and Carter-Rowley, J.

Wheater's Functional Histology: A Text and Atlas

Young, J.W.

Fifth edition (2006) Churchill Livingstone

Required Attire: Business Casual

TEACHING METHODS AND ACTIVITIES

Course Format: This course is delivered by previously recorded Self-Directed Learning (SDL) video sessions (available in Canvas). Live synchronous sessions will occur at least twice a week via real-time video conferencing software. During the live sessions, students will meet with the faculty or teaching assistants to reinforce and master the materials viewed during the SDL times.

Video Quizzes/Discussions: Each SDL video will have an associated quiz and discussion board. Quizzes may be taken when the student finishes reviewing the materials associated with the video. Due dates will be applied to each quiz and discussion assignment.

Labs: Students will prepare for labs by reading the assigned material and reviewing the corresponding structures prior the lab. During the lab session, students will use the handout as a guide to identify the assigned structures within the assignment that will be found in canvas.

EVALUATION OF STUDENT LEARNING

Grading procedures:

Final grade in Histology and Cell Biology is based on faculty evaluation of:

3-Partial examinations Each exam will include: Approximately 70% (Lecture/class material) Approx. 30% (Laboratory material)	85 %	Exam I – (Topics from Cell to Blood) Exam II – (Topics from Respiratory to Urinary) Exam III – (Topics from Endocrine to Eye/Ear) **Second and third lecture block exam may include 10% of material from the previous exam.
Laboratory Quizzes/Assignments	10%	Laboratory quizzes/assignments
SDL Video quizzes/discussions	5%	Participation in discussion posts is considered part of the students' professional development.
Total	100 %	It is important that you follow the guidelines of your program, about the minimum average required in the final grade.

Only Final grades will be rounded up. i.e 79.5% = 80%

Grading Scale:

The MSMS Program uses a unique grading scale for each course. Grading scales are subject to change over time. Please refer to your letter grade within Canvas to determine your current grade within each course. Your Program Moderator and Program Director can provide additional information.

Incomplete Work: Incomplete work due to illness or other serious circumstances during the course, that is not made up by the end of the term, will be reported as incomplete to the Registrar's Office. Upon completion and grading of the missing work, as determined by the course director and faculty, a change of grade report will be filed with the registrar's office to award the earned final grade. At the earliest possible time during or immediately after an absence that results in inability to complete course requisites, the student must communicate with the course director to make appropriate arrangements. Faculty are not obligated to repeat in-class session/groups discussions that were presented at scheduled times and dates. Communication with the course director does not replace nor substitute the student's obligation to properly notify Academic Affairs.

Laboratory Policies: Attendance to the entire (100%) laboratory period is required, in order for a student to take a laboratory quiz. There are NO repositions. Faculty will NOT answer/clarify possible doubts while taking a quiz. NO student is allowed to change/exchange group sessions or schedules without prior official approval from both the Histology Department and the office of Academic Affairs.

Discussions: Each topic

Examinations: Exams will be given in the dates indicated in the class schedule, and students will complete their exams using the Examsoft platform and the Exam Integrity Online Exam Administration Software. Each exam will include all the class material covered prior to the test. No changes will be made to the exam dates. The exams will consist of approximately 100 multiple-choice questions, structured in USMLE format, which should be answered in two hours.

Exam-taking policies for the Histology course will adhere to the Exam Integrity Software Policies and will use web-cam based exam proctoring and recording.

EXAM REPOSITION:

Any absence from an exam without a valid excuse from the Program Director will be counted as a zero (0); there will be no opportunity for a make-up exam. Excuses for absences to an exam are only processed through the Program Director and MSMS Director; however, students must inform the Course Director and Department Chair by e-mail within 24 hours of missing an exam that they will seek an official excuse.

Make-up exams for excused absences will be given AS SOON AS POSSIBLE but within seven (7) calendar days, by arrangement with the Course Director, only in such cases of absences officially excused by the Office of Academic Affairs. Courses will give a single make-up exam on a scheduled date within one week (e.g. Monday exam will be made up on or before the following Monday). Any student unable to attend the makeup exam will receive a zero (0) for that exam. Any student not receiving a valid excuse will receive a zero (0), at the discretion of the Program Director with MSMS Coordinator.

The content of the make-up exam will cover the same material, but the format may include objective (multiple choice questions) or essay questions and will be distinct from the original exam.

EXAM REVIEW & APPEAL POLICY:

Since exams will be administered using the Examsoft platform, students will not be provided the exam questions or answer choices after taking the exam. There is no option for challenging an exam question. Nonetheless, the students will receive a complete report of his/her performance on each exam. Any necessary revision of the exam will be performed by the Course Director and faculty according to the overall group performance on each question.

COMMUNICATION WITH FACULTY

Faculty will respond to emails within 48 business hours. Faculty will post a minimum of two virtual hours office hours per week to meet with students. Any concerns regarding the class, grades, testing accommodations etc. need to be directed to the lead instructor and if unresolved the Program Director.

ATTENDANCE:

Attendance will be measured by course interaction with videos, assignments, quizzes, labs, and live sessions.