

Degree in Radiology diagnosing imaging and radiotherapy techniques

Integrated Teaching: ANATOMY, HISTOLOGY AND HUMAN PHYSIOLOGY

SSD: BIO/16, MED/36, BIO/17, BIO/09

CFU: 8

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MODULE: Human Anatomy and Radiological Anatomy

SSD: BIO 16

CFU: 4

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MODULO: Histology

SSD: BIO/17

CFU: 1

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MODULO: Human Physiology

SSD: BIO/09

CFU 2

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MODULO: Radiological Anatomy

SSD: MED/36

CFU: 1

Professor: Simone Altobelli

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PREREQUISITES

Although there are no prerequisites, minimum basic knowledge of cell biology, histology and cytology is required.

Prior knowledge of the functioning of biological systems is required in order to optimize learning and the achievement of specific objectives.

LEARNING OBJECTIVES

At the end of the course, the student must be able to:

-Describe the macroscopic organization of the human body, using anatomical terminology appropriately; describe the main body cavities; describe the individual organs of the various apparatuses and systems from a macroscopic, microscopic and topographical point of view.

The purpose of the teaching is, starting from the knowledge of the basic projects and of the normal quantitative parameters of body functions and their variations in the different conditions of dynamic engagement, to develop in the student the ability to understand the principles of the functioning of the human body.

The cellular mechanisms and integrated functions of the main organs and systems aimed at maintaining body homeostasis in the context of environmental changes will then be analyzed. Knowledge of the main topics of radiological anatomy (Radiographic Imaging). The student will acquire notions of physics with particular regard to the processes underlying the radiographic images. Basic radiographic projections will be discussed.

LEARNING OUTCOMES

Knowledge and understanding

At the end of this course the student will have to:

- know basic anatomical terminology
- know the basic anatomical structures of the human body (musculoskeletal system, circulatory system, splanchnology)
- know the organization and basic structure of the central and peripheral nervous system
 - Identify the components of the different systems and their physical and functional relationships
- know the structures of the various tissues that make up the human body
- know the histological organization of the various human organs
- identify the morphology of the tissues, the cells that compose them, from a morphological and functional point of view
- have the ability to synthesize and correlate the various topics
 - have acquired the knowledge of the anatomical and functional organization of the apparatuses and systems that make up the human organism
 - have acquired the knowledge of the anatomical and functional organization of the main control systems of the functions of organs and systems
 - have acquired the ability to interpret the mechanisms and anatomo-physiological phenomena.
 - have acquired the ability to synthesize and correlate the various topics
 - have in-depth knowledge of the mechanisms implemented by the control systems of the functions of the organs and systems
 - have adequate knowledge of the different anatomical structures in radiographic projections
 - have an adequate knowledge of the elements of radiation physics underlying the radiographic images
 - have the ability to recognize the artifacts of radiographic images in order to distinguish them from anatomical structures and pathology.

Applying knowledge and understanding

At the end of the course, the student will be able to:

- Use the acquired knowledge of human anatomy and neuroanatomy for the understanding of human physiology and pathophysiology, a fundamental requirement for carrying out the profession in the health sector. The student will also be able to use the knowledge acquired for the autonomous study of aspects related to the specific field to which he will dedicate himself in the field of professional activity;
- use the knowledge of histology to understand other closely related branches of biology such as anatomy, cytology, physiology
- possess the knowledge of cell physiology to understand the mechanisms underlying the maintenance of homeostasis

- possess the integrated knowledge of Anatomy and Physiology on the integration and control systems that regulate the main phenomena of absorption and excretion of nutrients
- use the acquired knowledge for the autonomous deepening of the subject of study
- use the knowledge acquired to approach the subsequent dedicated courses
- use the anatomical knowledge acquired to carry out projections dedicated to precise anatomical structures.

Communication skills

At the end of the course, the student must:

- know the human anatomical structures adequately and know how to use specific anatomical terminology in order to be able to relate, within the care process, with users of all ages and / or with other health professionals, in an appropriate verbal form, not verbal and written
- use correct scientific terminology to identify, at a microscopic level, the different types of cells and tissues present in the human body
- use specific scientific terminology appropriately
- understand with appropriate scientific and technical terminology the radiographic projections and the various anatomical structures that can be viewed in the images obtained.

Making judgements

The student will be able to:

- develop professional autonomy in the context of a multidisciplinary approach to patient management. The acquired knowledge will allow the technician to manage the patient autonomously during the technical diagnostic or therapeutic process (data acquisition).
- carry out general assessments relating to the topics covered.
- carry out a basic assessment of the anatomical structures present in the images also in order to identify and correct any malpositioning of the patient.

COURSE SYLLABUS

Human Anatomy and Radiological Anatomy

LOCOMOTOR SYSTEM. (11 hours) axial skeleton: skull, vertebral column, vertebrae, pelvic girdle. Appendicular skeleton: shoulder girdle, arm bones, forearm and hand, thigh bones, leg and foot. Joints: classification and movements. Temporomandibular joint, sternoclavicular joint, shoulder joint, intervertebral joint, elbow joint, radio ulnar joint, wrist and hand. Joints of the hip, knee, ankle. Muscular skeletal system. Axial musculature: head, neck, extrinsic muscles of the eye, tongue, pharynx, major muscles associated with the spine, diaphragm, muscles of the perineum and urogenital diaphragm. Appendicular muscles: shoulder girdle and arm. Thigh muscles and main leg muscles.

CARDIOVASCULAR SYSTEM. (8 hours) Heart, coronary circulation, thoracic aorta, abdominal and their main branches. Willis polygon. Main arteries of the lower limbs. Venous system: hollow veins and its major tributaries. Main veins of the upper limb, thorax, abdomen and lower limb. Portal circulation. Fetal circulation. General information on the lymphatic system.

SPLANCNOLOGY (11 hours) Microscopic and macroscopic anatomy of the digestive, respiratory, urinary, reproductive and endocrine tracts.

NEUROANATOMY (10 hours) Spinal cord: sections and internal organization: gray matter, ascending and descending tracts. Spinal nerves, nerve plexuses and reflex arches. Brain stem

(Medulla oblongata, Pons, Mesencephalon): internal and external structure. Cranial nerves: nuclei of origin and innervation. Diencephalon (Thalamus, Hypothalamus, Epithalamus): internal and external structure. Thalamic nuclei. Telencephalon: internal and external structure. Anatomical and functional organization of the cerebral cortex. Allocortecchia. Basal ganglia. Cerebellum: internal and external structure. Ventricle system. Meninges. Blood circulation of the brain and dural sinuses. Sensory system: spinothalamic tract, fasciculus gracilis and cuneatus tracts, spinocerebellar tract. Conduction of pain. Visual, auditory, gustatory, olfactory and limbic system. Motor system: pyramidal and extrapyramidal tracts. Motor nuclei. Autonomic nervous system: sympathetic and parasympathetic system. Enteric nervous system.

Histology

Preparation of tissues for histological analysis

Microscopy, preservation of biological structures, stains.

The Epithelia

Classification of epithelia, polarity of epithelial cells, junctions, absorbent epithelia, glandular epithelia.

The Connective

Connective proper: extracellular matrix and connective cells. The different types of connective proper. The adipose tissue. Supportive connective tissue: cartilage and bone. Blood and hematopoietic tissues.

Muscle tissue

Skeletal muscle: structure of muscle fibers, mechanism of contraction, diversity of muscle fibers. The heart muscle: structure of cardiomyocytes and myocardial conduction mechanism. Smooth muscle.

The Nervous Tissue

The neuron. The glial cells. Myelinated and unmyelinated nerve fibers. General structure of the nerves.

Human Physiology

Cell membrane physiology:

- Transport of ions and molecules across the cell membrane
- Membrane potential and action potential

Muscle Physiology:

- Excitation and contraction of skeletal muscle tissue.
- Neuromuscular transmission and excitation-contraction coupling.
- Motor unit

Nervous System Physiology:

- The sensory system: decoding and processing of sensory information.
- The motor system: general characteristics of the motor system: involuntary, voluntary and automatic movements; spinal reflexes; trunk-brain control of movement: posture and balance. Cortical control of voluntary movements. The cerebellum: general characteristics, functions of the cerebellum. The basal ganglia: functional role.
- The autonomic nervous system.
- Integrative functions of the nervous system.

Cardiovascular Physiology:

- Myocardial physiology: functional anatomy of the myocardium, action potentials of the myocardium, contraction of the heart muscle.
- Cardiac cycle
- Nervous control of cardiac activity.
- General principles of hemodynamics.
- Regulation of circulation, blood pressure and blood flow.
- Cardiac output: principles of regulation of cardiac output.
- Heart tones.

The Respiratory System:

- Pulmonary ventilation: respiratory mechanics, lung volumes and capacities. Respiratory tract
- Gaseous exchanges: diffusion of oxygen and carbon dioxide through the respiratory membrane.
- Transport of oxygen and carbon dioxide into the blood and body fluids.
- Regulation of breathing: general principles.
- Acid-base balance regulation: general principles.

Body fluids and kidney function:

- Functional anatomy of the kidney, function of the nephron. Glomerular filtration: general principles.
- Processing of the glomerular filtrate: tubular reabsorption and secretion,
- Checking the osmolarity and sodium concentration of the extracellular liquid: general principles.
- Renal regulation of blood volume: general principles

The endocrine system:

- General principles of endocrinology: nature of a hormone; general picture of the endocrine glands and their hormones. Principles of general functioning of hormones.

Radiological Anatomy

1. Radiographic anatomy of the head-neck region
2. Radiographic anatomy of the thorax
3. Radiographic anatomy of the abdomen and pelvis
4. Radiographic anatomy of the limbs

COURSE STRUCTURE

The Human Anatomy module is organized in lectures (40 hours) and theoretical-practical exercises. During the lessons, the explanation of human anatomy will be performed by projecting illustrative images (Power-Point) and through the use of real-time 3D visual tools (Complete Anatomy) and models. During the exercises, students will be able to use anatomical models that reproduce organs and anatomical systems in a perfectly equipped exercise room.

The Histology module is structured in 10 hours of frontal teaching (divided into lessons of 2 or 4 hours based on the academic calendar) during which the teacher makes use of Power Point presentations and uses images of histological preparations obtained with an optical microscope and electronic and audiovisual media.

The Physiology module is structured in 20 hours of frontal teaching divided into lessons of 2, 3 or 4 hours based on the academic calendar.

The radiological anatomy module consists of 10 hours of frontal teaching divided into lessons of 2/3 hours as indicated on the academic calendar.



COURSE GRADE DETERMINATION

Human Anatomy and Radiological Anatomy

The assessment of learning takes place on the basis of a written test consisting of open and closed multiple choice answers, and an eventual oral test. For each written test, different grades are assigned to the answers depending on the difficulty of the question and according to the answers given (complete or partial) for a maximum of 25 points. In some cases, if the answer is clearly wrong, 0.5 points can be deducted from the final grade. Students who reach the minimum score of 18/30 in the written test may request to be admitted to the oral exam. At the oral exam the student can be assigned 8 points, which will be added to that of the written test score, for a maximum of 30/30 cum laude (33/30). During the oral exam can be deducted from the written test grade, up to 8 points.

Students who at the end of the oral exam have achieved a grade of less than 18/30 will be rejected. As part of the integrated course, the grade gained by the student contributes to the final score proportionally to the CFUs.

Histology

The exam will be done in written form and will consist of about 30 multiple choice questions, for each correct answer a point will be awarded. The final score of the written test will be given by the sum of the partial scores assigned to each question answered correctly.

All the contents of the course are subject to evaluation.

The evaluation includes the identification of the achievement of the objectives set and in particular for each topic will be evaluated:

- the level of acquisition of knowledge of the topics covered
- the ability to synthesize and correlate the various topics.

Human Physiology

The intermediate test consist in 30 multiple choice question.

The final evaluation consists of an oral exam that will take place on the scheduled available dates of the calendar exam.

Radiological anatomy

At the end of the lectures, for the assessment of learning there will be a written exam with 5 radiographic images with 30 anatomical structures to be named correctly. 18 will be the minimum score to pass the written test.

OPTIONAL ACTIVITIES

Students will have opportunity to conduct theoretical/practical exercises and to attends at seminars. Professors will provide constant support during and after the lessons.

Histology

In addition to the teaching activity, the student will be given the opportunity to take advantage of tutoring activities on request.

Human Physiology



In addition to the teaching activity, the student can be given the opportunity to participate in seminars and monographic courses. The topics of the activities are not subject to examination. The acquisition of the assigned hours occurs only with a mandatory frequency of 100% and eligibility is required.

READING MATERIALS

- Martini, Timmons, Tallitsch: Human Anatomy,
- Tortora: Human Anatomy,
- Martini Nath: Anatomy & Physiology
- Gli studenti sono incoraggiati ad usare un Atlante di Anatomia Umana
- "Bloom and Fawcett's Concise Histology", Don W. Fawcett, Ronald P. Jensch, William Bloom – 2nd Edition - Hodder Arnold.
- "Berne & Levy Physiology", Sixth Updated Edition
- "Sherwood" ninth edition
- "Guyton-Hall"
- Radiobiology for the radiologist / Eric J. Hall, Amato J. Giaccia.—7th ed.
- Bontrager's Handbook of Radiographic Positioning and Techniques 9th Edition by Lampignano John; Kendrick, Leslie E.

Students are encouraged to use an Human Anatomy Atlas.