

## DEGREE IN NURSING

**INTEGRATED TEACHING:** ANATOMY AND PHISIOLOGY

**NUMBER OF CFU:** 6

**SSD:** BIO/09, BIO/16, BIO/17

**RESPONSIBLE PROFESSOR:** MICOL MASSIMIANI

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MODULE: HUMAN ANATOMY

NUMBER OF CFU: 3

SSD: BIO/16

PROFESSOR: ANTONIA NUCERA

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MODULE: PHYSIOLOGY

NUMBER OF CFU: 2

SSD: BIO/09

PROFESSOR: ANGELA ANDREOLI

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<https://www.unicamillus.org/personnel/andreoli-angela-2/>

MODULE: HISTOLOGY

NUMBER OF CFU: 1

SSD: BIO/17

PROFESSOR: MICOL MASSIMIANI

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### **PREREQUISITES**

Mandatory preparatory knowledges are not required, however basic knowledge about chemistry, physics, biology and cytology are necessary.

## **LEARNING OBJECTIVES**

At the end of this course, the students will be able to :

- describe the macroscopic organization of the human body using the appropriate terminology ;
- describe the main cavities of the body, describe the individual organs of the various apparatuses and systems from the macroscopic, microscopic and topographic point of view;
- provide students with knowledge on the functions of the various organs and systems of the human body and the mechanisms underlying these functions.

The course also aims to provide knowledge on the functional integration of the various systems and on their regulation in physiological conditions also for the purpose of maintaining homeostasis. The course aims to provide student with the skills necessary for the full understanding of the most important tissues of the human organism.

The student should acquire correct terminology and develop those skills of interpretation and application that, the graduate in nursing, will then have to use in the planning and management of work activities.

## **LEARNING OUTCOMES**

### **Knowledge and Understanding**

At the end of the course the student is required to know:

- basic terminology of human anatomy
- basic organization of human anatomical structures (LOCOMOTOR SYSTEM, CARDIO-SPLANCHOLOGY)
- basic organization of neuroanatomical structures
- the identification of specific component of the anatomical regions and their functional and physical interaction
- the anatomical and functional organization of the apparatuses and systems that make up the human organism
- the anatomical and functional organization of the main control systems regulating the functions of the organs and apparatuses and their mechanisms of action
- how to interpret mechanisms and anatomical-physiological phenomena
- the structures of the various tissues that compose the human organism
- the histological organization of the various human organs
- how to identify tissues and the cells that compose them, from a morphological and functional point of view
- bodily functions, the molecular and cellular mechanisms underlying the functioning of the various organs and systems and the main processes of integration, regulation and homeostatic control
- the principles underlying measurements of physiological parameters such as blood pressure, electrical activity of the heart and respiratory parameters

- how to synthesize and correlate the various topics.

### **Applying knowledge and understanding**

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

- Use the knowledge of human anatomy and neuroanatomy to better understand the human physiology and physiopathology, necessary knowledge equipment for professionals in the field of human health.
- Use the knowledge of physiology to understand the mechanisms underlying the maintenance of homeostasis and foresee the potential consequences of alterations affecting these mechanisms. To apply the histology knowledge to understand other closely related branches of biology such as anatomy, cytology, physiology.
- The students will also use the knowledge collected to further study some specific topics required by their profession.

### **Communication skills**

At the end of the course the student must know adequately the anatomical structures and functions of human body and be able to use the specific terminology so as to be able to relate, within the care process, with patients of all ages and/or with other health professionals, in an appropriate verbal, non-verbal and written forms. Use correct scientific terminology to identify the microscopic and macroscopic characteristics of the organs and to describe the physiological processes underlying their functioning. Use correct scientific terminology to identify, at a microscopic level, the different types of cells and tissues present in the human organism.

### **Making judgements**

The knowledge of anatomy, physiology and histology will help the student in nursing to develop a critical thinking in the ability to decide priorities in response to the needs of nursing care in relation to the different levels of care complexity.

## **COURSE SYLLABUS**

### **Syllabus HUMAN ANATOMY**

- **LOCOMOTOR SYSTEM.** Skeleton: skull, vertebral column and main bones of the trunk, superior limb, inferior limb, pectoral and girdle and pelvis. Joints structure and classification, movements. Joints: Temporo-mandibular joint, shoulder joint, intervertebral joints, sterno-clavicular joint, elbow joint, radioulnar joints, wrist and hand joints. Hip joint, joint of the knee, ankle. Skeletal Muscular System: masticatory muscles (masseter, temporal, pterygoid). Motor muscles of the humerus (rotator cuff muscles, deltoid, teres major, pectoralis major, latissimus dorsi, brachial, coracobrachial), flexor and extensor muscles of the elbow (biceps brachialis, brachioradialis, triceps brachialis, anconus). Respiratory muscles (diaphragm, intercostal muscles, sternocleidomastoid, serratus posterior and anterior muscles, pectoralis minor, scalene,

quadratus lumborum, external / internal oblique muscle, transversus abdominus, rectus of the abdomen).

- **CARDIOVASCULAR SYSTEM.** Heart, thoracic aorta, aortic arch, abdominal aorta. The Willis's polygon. Coronary circulation. Main arteries of superior and inferior limbs. Venous system. Superior vena cava, inferior vena cava and their main branches in the thorax and abdomen. Main veins of the superior and inferior limbs. Portal circulation. Foetal circulation. Generalities on the lymphatic system.
- **SPLANCHNOLOGY.** Systemic and microscopy anatomy of digestive, respiratory, urinary, reproductive and endocrine Systems.
- **NEUROANATOMY.** Spinal cord: segmental and internal organization: gray matter, ascending and descending tracts. Spinal nerves, plexuses and reflex arcs. Brainstem (Medulla oblongata, Pons, Mesencephalon): internal and external structure. Cranial nerves: nuclei and innervation. Diencephalon (Thalamus, Hypothalamus, Epithalamus): internal and external structure. Thalamic nuclei. Telencephalon: internal and external structure. Anatomical and functional organization of cerebral cortex. Allocortex. Basal Ganglia. Cerebellum: internal and external structure. Ventricular system. Meninges. Brain blood vessels and dural sinuses. Sensory system: spinothalamic, tactile, fasciculus gracilis and fasciculus cuneatus tracts, spinocerebellar tracts. Pain conduction. 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.

## **Syllabus PHYSIOLOGY**

- Introduction to physiology and homeostasis concepts.
- Cellular physiology. Transport of solutes and water across the cell membrane. Resting membrane potential. Genesis and propagation of action potential. Synaptic transmission.
- Muscle Physiology. Functional properties of skeletal, smooth and cardiac muscle. Excitation and contraction of skeletal muscle. Neuromuscular junction and excitation-contraction coupling. Motor unit.
- Nervous System. Functional organization of central and peripheral nervous system. Overview of autonomic nervous system. Functional organization of sensory systems. Coding and processing of sensory information. The motor system: organization of movement: reflexes, voluntary and automatic movements; posture and balance. Control of voluntary movements. The cerebellum: general features and functions. The basal ganglia: organization and functional role.
- Cardiovascular system. Organization of cardiovascular system. Cardiac electrophysiology: pacemaker activity and specialized conductive system of the heart. ECG. The cardiac muscle and cardiac cycle. Cardiac output and its regulation. Hemodynamics: blood flow, pressure, vascular resistance and their regulation. Principles of blood pressure measurement. Microcirculation: capillary exchange of solutes and water.
- The Respiratory System. Organization of respiratory system. Mechanics of ventilation. Gas exchange in the lungs: diffusion of O<sub>2</sub> and CO<sub>2</sub> across the respiratory membrane. Transport of

O<sub>2</sub> and CO<sub>2</sub> in blood and body fluids. Regulation of breathing: general principles. Regulation of acid-base balance: general principles.

- The urinary system. Functional organization of the urinary system. Function of the nephron. Glomerular filtration: general principles. Elaboration of glomerular filtrate: resorption and tubular secretion. Homeostatic functions of the kidney. Control of osmolality and volume of extracellular fluid: general principles.
- endocrine system. Definition and classification of hormones. General characteristics of the endocrine glands and the function of their hormones
- digestive SYSTEM organization of the digestive system. Motility and gastrointestinal secretions. General principles of digestion and absorption of nutrients.

### **Syllabus HISTOLOGY**

- Preparation of tissues for histological analysis. Microscopy, preservation of biological structures, stainings.
- Epithelial tissue. General characteristics of epithelia, junctions, polarity of epithelial cells, surface specializations, basal lamina, classification of epithelia, endothelium, absorbent epithelium, pseudostratified epithelium, transitional epithelium, epidermis, glandular epithelia (exocrine and endocrine glands).
- Connective tissue. Histological organization: extracellular matrix (macromolecules of the ground substance, collagen and elastic fibers) and connective cells (fibroblasts, adipocytes, macrophages, plasma cells and mast cells). The different types of connective proper: loose and dense (irregular and regular). The white and brown adipose tissue. Supportive connective tissues: cartilage (cells and extracellular matrix, hyaline, elastic and fibrous cartilage, growth and repair) and bone (cells and extracellular matrix, compact and spongy bone, osteogenesis, growth and repair). Blood: plasma and serum, cells (red blood cells, neutrophils, eosinophils, basophils, monocytes and lymphocytes), platelets, hematopoiesis. Outline of the lymphatic system.
- Muscle tissue. Skeletal muscle: organization of muscle fibers, myofibrils and myofilaments, sarcomere, sarcoplasmic reticulum, neuromuscular junction, contraction mechanism, regeneration. Cardiac muscle: structure of cardiomyocytes (intercalated discs, sarcoplasmic reticulum, myofilaments), Purkinje fibers, regeneration. Smooth muscle: structure of smooth muscle cells, contractile apparatus, regeneration.
- Nervous tissue. The neuron. Myelinated and unmyelinated nerve fibers. General structure of the nerves. Synapses. Glial cells.

### **COURSE STRUCTURE**

The module of Human Anatomy is taught by lectures (42 hours) and theoretical/practical exercises. During lectures, explanation of human anatomy will be performed by projecting images (Power-Point) and using Anatomical 3D Real-time Viewer tools (Complete anatomy tools) and anatomical

modelling. During exercises, students will use anatomical modelling reproducing organs and anatomical system in a fully equipped exercitation room.

The module of Physiology is organized into lectures (28 hours divided into lessons of 2 or 4 hours according to the academic calendar). The lessons are supported by visual aids (slides, animated movies, etc.) that stimulate the interest of learners and help the teachers to explain the concepts easily.

The module of Histology is structured in 14 hours of frontal teaching (divided into lessons of 2 or 4 hours according to the academic calendar) during which the Professor uses Power Point presentations and uses images of histological preparations obtained with an optical microscope and electronic and audiovisual media.

### **COURSE GRADE DETERMINATION**

The examination of the Integrated Course of Anatomy and Physiology consists of a written examination with 30 multiple choice questions for each of the module of Human Anatomy, Physiology and Histology whose mark is an integral part of the evaluation of the examination of the teaching. All the contents in syllabus are subject to evaluation. The exam will be considered passed if the student totals a final score of 18/30. The knowledge and ability to understand, the ability to apply knowledge and understanding and the autonomy of judgment will be evaluated. The grade earned by the student in each module contributes to the final score in proportion to the credits. The final grade will be assigned by the Commission, collectively.

The evaluation criteria considered will be: acquired knowledge, independent judgment, communication skills and learning skills. The exams will be assessed according to the following criteria:

<b>&lt; 18</b> <b>insufficient</b>	The candidate possesses an inadequate knowledge of the topic, makes significant errors in applying theoretical concepts, and shows weak presentation skills.
<b>18 - 20</b>	The candidate possesses a barely adequate and only superficial knowledge of topic, limited presentation skills, and only an inconsistent ability to apply theoretical concepts.
<b>21 – 23</b>	The candidate possesses an adequate, but not in-depth, knowledge of the topic, a partial ability to apply theoretical concepts, and acceptable presentation skills.
<b>24 – 26</b>	The candidate possesses a fair knowledge of the topic, a reasonable ability to apply theoretical concepts correctly and present ideas clearly.

- 27 - 29** The candidate possesses an in-depth knowledge of the topic, a sound ability to apply theoretical concepts, good analytical skills, clear argumentative clarity and an ability to synthesize
- 30 - 30L** The candidate possesses an in-depth knowledge of the topic, an outstanding ability to apply theoretical concepts, a high level of argumentative clarity, as well as excellent analytical skills, and a well-developed ability to synthesize and establish interdisciplinary connections.

### OPTIONAL ACTIVITIES

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

### READING MATERIALS

Reading materials for HUMAN ANATOMY:

- Martini, F., Timmons, M. J., Tallitsch, R. B., Ober, W. C., Garrison, C. W., Welch, K. B., & Hutchings, R. T. (2014). Human anatomy (p. 904). Prentice Hall
- Martini, F. H., & Nath, J. L. (2009). Fundamentals of Anatomy & Physiology (8 uppl.)
- Tortora, G. J., & Derrickson, B. H. (2018). Principles of anatomy and physiology. John Wiley & Sons
- Gli studenti sono incoraggiati ad usare un Atlante di Anatomia Umana.

Reading materials for PHYSIOLOGY:

- Koeppen, B. M., & Stanton, B. A. (2017). Berne and levy physiology (7 edition). Elsevier Health Sciences
- Martini, F. H., & Nath, J. L. (2009). Fundamentals of Anatomy & Physiology (8 uppl.)
- Sherwood, L. (2015). Human physiology: from cells to systems. Cengage learning.
- Guyton, A. C., & Hall, J. E. (2021). Textbook of medical physiology (14 edition). Philadelphia: Saunders

Reading materials for HISTOLOGY:

- Fawcett, D.W., Jensch, R.P. (2008). Bloom and Fawcett's Concise Histology (2 edition). Hodder Arnold.