

## BASI ANATOMO-FISIOLOGICHE DEL CORPO UMANO (FIS112)

### 1. language

Italian.

### 2. course contents

Coordinator: Prof. MARTINA ALBINI

Year Course: 1<sup>st</sup>

Semester: 1<sup>st</sup>

UFC: 9

Modules and lecturers:

- ANATOMIA UMANA (FIS06A) - 4 CFU - SSD BIO/16 - Prof. Angelo Goglia, Riccardo Antonio Ricciuti
- FISIOLOGIA UMANA (FIS05A) - 4 CFU - SSD BIO/09 - Prof. David Topini, Martina Albini
- ISTOLOGIA (FIS04A) - 1 CFU - SSD BIO/17 - Prof. Cristiana Angelucci

### 3. BIBLIOGRAPHY

*G. Sica et al. "Istologia per le Professioni Sanitarie" - SORBONA*

*F.H. Martini "Fondamenti di Anatomia e Fisiologia", EdiSES*

*F.H. Martini, R.B. Tallitsch, J.L. Nath "Anatomia Umana" EdiSES*

*M. McKinley - V.D. O'Loughlin "Anatomia Umana", Ed. Piccin*

*F. H. Netter: Atlante di Anatomia, Fisiopatologia e clinica; Vol. 8, App. Muscolo-scheletrico; CIBA Ed.*

*I. A. Kapandij: Fisiologia Articolare; M.E.D.*

*Guyton: Trattato di Fisiologia Medica; Piccin Ed.*

*CL Stanfield, "Fisiologia", EdiSES*

*S. Silbernagl - A. Despopoulos, "Fisiologia – Atlante Tascabile", Casa Editrice Ambrosiana*

*E. Bossi et al., "Fisiologia Umana, Elementi", Edi-Ermes*

### 4. LEARNING OBJECTIVES

The course aims to provide students with basic knowledge essential for studying professional disciplines, enabling the correct application of diagnostic and rehabilitative procedures in physiotherapy.

Specifically:

The Histology module aims to provide students with knowledge of differentiated cells and their organization into tissues. This involves understanding how cells specialize in various functions and how they aggregate to form the different types of tissues in the human body, such as epithelial, connective, muscle, and nervous tissue.

The Anatomy module, on the other hand, focuses on understanding the organization of individual systems and organs. This includes the detailed study of the physical structure of organs, their anatomical location, the relationships between the organs themselves, and their functional organization within the various body systems (such as the cardiovascular, respiratory, digestive, nervous systems, etc.). The Physiology module focuses on the functions of the various organs and the general mechanisms of functional control under normal conditions. Its goal is to help students understand any observed pathological changes and be aware of the medical interventions required

in the practice of their profession.

Learning Outcomes:

**Knowledge and Understanding:** The student must demonstrate a comprehensive understanding of the general characteristics of living organisms, the morpho-functional organization of cells and subcellular structures, the structural organization of the human body at both microscopic and macroscopic levels, the characteristics of tissues, the organization of the body's systems, the structure, position, and relationships of organs, and the functional relationship between anatomical structures, with particular emphasis on the musculoskeletal, muscular, and central and peripheral nervous systems. Additionally, the student must demonstrate knowledge of the vital functions of humans, necessary to understand the functioning of various organs and systems, their regulatory mechanisms, and the main processes of integration and homeostatic control.

**Applied Knowledge:** The student must demonstrate the ability to adequately interpret and understand the potential applications of the knowledge acquired, highlighting its translational implications in the diagnostic and therapeutic fields.

**Autonomy of Judgment:** The student must develop independent skills in integrating the knowledge acquired in order to recognize the differences between organs of the body and their function under both physiological and non-physiological conditions.

**Communication Skills:** The student must be able to identify tissues and anatomical structures and describe their functional characteristics using correct terminology. They should also be able to communicate clearly and unambiguously with both specialist and non-specialist audiences.

**Learning Skills:** The student must be able to self-assess their competencies, expand their knowledge, and stay up to date by independently consulting textbooks, scientific articles, and online platforms.

## 5. prerequisites

Students are expected to have basic knowledge of scientific subjects, particularly in chemistry, physics, and biology.

## 6. TEACHING METHODS

The course includes lectures that cover both fundamental elements and practical applications. Interactive methods such as problem-based learning, self-learning, and case studies will also be used.

## 7. OTHER INFORMATIONS

It is always possible to schedule a meeting with one of the course professors by requesting it via email."

## 8. METHODS FOR VERIFYING LEARNING AND FOR EVALUATION

The exam consists of an oral test with questions on course topics, assessing students' understanding and presentation skills. In-course assessments may also be conducted. The final grade is expressed out of 30, and students must score at least 18/30 in each module. The final grade is the weighted average of individual module scores. A full and thorough response in all modules can lead to a maximum grade of 30/30 cum laude.

## 9. program

### Histology

Definition and classification of tissues.

**Epithelial tissue:** general overview. Covering epithelia: classification, cytological features, and examples of anatomical distribution. Glandular epithelia: general characteristics of the structure of exocrine glands, anatomical distribution of endocrine glands.

**Blood:** circulating cells; plasma; serum; hematopoiesis and hematopoietic tissue.

**Connective tissues:** general overview; components of the extracellular matrix (fibrillar collagens, elastin, proteoglycans, glycoproteins, minor collagens). Proper connective tissue: cell types; extracellular matrix; classification and anatomical distribution of different types; tissue regeneration and aging. Cartilaginous tissue: cell types; cartilage matrix;

classification and anatomical distribution of cartilage; chondrogenesis; tissue regeneration and aging. Bone tissue: characteristics and distribution of compact and trabecular bone; cell types; bone matrix; types of ossification; bone remodeling and reshaping; tissue aging.

**Nervous tissue:** general overview; morphological, structural, and ultrastructural features of neurons; ultrastructural architecture of axons and myelin sheath; nervous and neuromuscular synapses with basic histophysiological concepts; histological and functional classification. Glial cells. White matter and gray matter of the CNS. Structure of peripheral nerves. Histogenesis; tissue regeneration and aging.

**Muscle tissue:** general overview; histogenesis. Striated skeletal muscle tissue: cell types; integration with connective tissue; structural and ultrastructural characteristics of striated skeletal muscle fiber; type of innervation and basic histophysiological concepts; tissue regeneration and aging. Striated cardiac muscle tissue: ultrastructural characteristics of striated cardiac muscle fiber; type of innervation and basic histophysiological concepts; tissue regeneration and aging. Smooth muscle tissue: ultrastructural features of smooth muscle fibers; types of innervations and basic histophysiological concepts; tissue regeneration and aging.

## Human Anatomy

**Organization of the human body:** reference planes, directional terms, anatomical nomenclature, levels of organization of the human organism, body regions, and cavities.

**Cardiovascular system:** heart, topography, relations, cardiac chambers, internal and external configuration and features. Pericardium. Coronary arteries and veins. Systemic and pulmonary circulation. Aorta and main distribution branches (branches of the aortic arch, thoracic aorta, abdominal aorta). Main arterial and venous vessels of the head, abdomen, thorax, portal vein, and vena cava. Anatomical differences between arterial and venous walls, brief mention of blood cells.

**Lymphatic system:** general overview, characteristics of lymphatic vessels, brief overview of the structure of lymph nodes, spleen, and tonsils.

**Respiratory system:** relations, internal and external configuration, brief mention of microscopic structure. Anatomy of the nose and nasal cavities, vascularization of the nose. Brief anatomy of the pharynx, larynx, trachea, and their vascularization. Anatomy of the bronchi, bronchial tree, and lungs. Pleura.

**Peritoneum:** general organization and relations within the abdominal and pelvic cavities.

**Digestive system:** anatomical relations of the various organs, brief overview of microscopic anatomy and vascularization of the oral cavity and its appendages (tongue and teeth). Pharynx, esophagus, stomach, duodenum, jejunum, ileum, colon. Major salivary glands, liver and biliary ducts, pancreas (relations, internal and external configuration, vascularization).

**Urinary system:** relations, micro and macroscopic structure, the nephron, kidneys, bladder, ureters, male and female urethra. Vascularization.

**Reproductive system:** brief anatomy of the male and female reproductive systems.

**Nervous system:** definition and location of gray and white matter.

Macroscopic anatomy of the spinal cord, globally and in cross-section, with knowledge of segmental organization necessary for understanding the physiology of spinal functions. Schematic description of the main ascending and descending neuronal systems.

Brainstem, cerebellum, thalamus, hypothalamus, telencephalon with basal nuclei and essential knowledge of the main sensory and motor projection pathways, with brief mention of the control exerted by specific descending systems on the locomotor apparatus.

Structure of the cerebral cortex.

Anatomy of the peripheral nervous system: including cranial nerves, spinal nerves, and their convergence into nerve plexuses; origin, course, and innervation areas of the main peripheral nerves.

## Human Physiology

**Introduction:** principles of physiology of the different cell types present in the nervous system.

**Excitability, electrogenesis, membrane potential.** Ion channels. Action potential. Propagation of the action potential. Synapses and synaptic transmission. Membrane receptors and signal transduction. Neurotransmitters.

**Functional organization of the central and peripheral nervous system.** Autonomic nervous system: sympathetic and parasympathetic.

**Functional organization of sensory systems:** proprioception and pain. Cerebral cortex: functional specificity of cortical areas relevant to perceptual, praxis, and cognitive activities.

**Physiology of the somatic motor system.** Reflexes. Control of posture and movement.  
**Cerebellum and basal ganglia.**

**Bone physiology.** Functions of the skeleton. Functions of bone tissue. Calcium homeostasis. Bone remodeling system. Regulation of bone metabolism.

**Muscle physiology.** Functional organization of muscle. The functional unit of the muscle (the sarcomere). The neuromuscular junction. The mechanism of muscle contraction. Muscle energy metabolism.

**Joint physiology.** Functional organization of the joint. Synovia and synovial fluid, the joint capsule, and ligaments. Articular cartilage: collagen and proteoglycans.

**Physiology of the cardiovascular system.** Functional organization of the cardiovascular system. The heart as a pump. Cardiac electrical activity. Blood pressure. Mechanisms of heart rate and blood pressure control. Pressure gradients and metabolic exchanges between blood and tissues.

**Physiology of the respiratory system.** Functional organization of the respiratory system. Physiology of respiration. Lung volumes. Gas exchange at the alveolar-capillary level.

**Physiology of the urinary system.** Functional organization of the urinary system. The functional unit of the kidney: the nephron. Mechanisms of glomerular filtration, tubular reabsorption, and secretion; urine formation. The role of ADH. Overview of the renin-angiotensin-aldosterone system.

**Physiology of the endocrine system.** Functional organization of the endocrine system. Definition and classification of hormones. Feedback control systems. Neurohypophysis, adenohypophysis, and the hypothalamic-pituitary system. Thyroid and parathyroid glands: formation, secretion, and functions of thyroid hormone. Calcitonin and parathyroid hormone. Adrenal hormones and their functions. Endocrine pancreas: insulin and glucagon and their functions.

**Physiology of the digestive system.** Functional organization of the digestive system. Mechanisms of digestion and nutrient absorption. The concept of enzymes. The mechanical phase of digestion: chewing, swallowing, bolus progression, and its nervous control. The chemical phase of digestion: gastric, pancreatic, and bile secretion. Digestion of carbohydrates, proteins, and lipids. Functions of the liver and exocrine pancreas.

**Overview of special joint physiology:** shoulder joint, hip joint, knee joint, spine joint.