

BSc in Physiotherapy

INTEGRATED COURSE TITLE: **HUMAN ANATOMY AND PHYSIOLOGY**
NUMBER OF ECTS CREDITS: 6
SSD: BIOS-06/A, BIOS-12/A, BIOS-13/A
MODULE CONVENOR: PROF.SSA ANNALISA TASSONE
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MODULE: HUMAN ANATOMY

NUMBER OF ECTS CREDITS: 3

SSD: BIOS-12/A

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MODULE: PHYSIOLOGY

NUMERO DI CFU: 2

SSD: BIOS-06/A

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MODULE: HYSTOLOGY

NUMERO DI CFU: 1

SSD: BIOS-13/A

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PREREQUISITES

Although there are no prerequisites, minimum basic knowledge of cell biology, histology and cytology is required, in order to optimize learning and the achievement of specific objectives. This makes the content of the teaching more comprehensible.

LEARNING OBJECTIVES

The aim of the integrated course is to provide students with the main knowledge on:

- the macroscopic organization of the human body, appropriately using anatomical terminology with particular reference to the systems of which the future physiotherapist will be required to have specific knowledge;
- the main body cavities, the individual organs of the various systems from a macroscopic, microscopic and topographic point of view;
- the functions of the human body and the mechanisms underlying these functions. Furthermore, the course aims to provide knowledge on the functional integration of the various systems and their regulation in physiological conditions, during homeostatic processes, and when physiological homeostasis is lost. This knowledge will provide the student with a physiological reference framework necessary for understanding the disciplines that they will follow during their studies and the health interventions required in carrying out the profession;
- full understanding of the most important tissues of the human organism. The student

must be able to acquire correct terminology and develop the interpretation and application skills that the physiotherapy graduate will then have to use in planning and managing work activities.

LEARNING OUTCOMES

Knowledge and Understanding

- At the end of this course, students will be able to:
- Know basic anatomical terminology
- Know the basic anatomical structures of the human body, locomotor 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
- Understand the basics of normal human physiology with particular attention to the functioning of the musculoskeletal, nervous and cardiovascular systems
- Demonstrate an understanding of basic human physiology
- Recognize how abnormal physiology impacts human function and dysfunction
- Understand the importance of maintaining homeostatic processes
- Know the structures of the various tissues that make up the human organism
- Know the histological organization of various human organs
- Identify the morphology of tissues, the cells that compose them, from a morphological and functional point of view
- Synthesize and correlate the various topics.

Applying knowledge and understanding

- At the end of this course the student will be able to:
- use the acquired knowledge of human anatomy and neuroanatomy to understand human physiology and pathophysiology, a fundamental requirement for carrying out the profession in the healthcare sector. The student will also be able to use the knowledge acquired for the independent study of aspects relating to the specific field to which he will dedicate himself as part of his professional activity;
- understand the clinical relevance of the knowledge acquired in reference to the effects in the diagnosis and treatment of the loss of physiological homeostasis with particular reference to the musculoskeletal axis;
- apply the knowledge of histology to understand other closely related branches of biology such as anatomy, cytology, physiology.

Communication skills

At the end of the course the student will be able to use correct scientific terminology to identify the various anatomical districts, the different types of cells and tissues present in the human organism, the functions of the human body in relation to the scientific knowledge acquired and apply the notions to identify the "non-physiological" dysfunction of the organism. They will also be able to relate within the care process with users of all ages and/or

with other healthcare professionals, in an appropriate verbal, non-verbal and written form.

Making judgements

Knowledge of human anatomy, physiology and histology will help the physiotherapist to develop critical thinking in the ability to decide the correct response to assistance needs in relation to the different levels of complexity of the rehabilitation intervention.

Learning Skills

The student will have acquired skills and learning methods suitable for deepening and improving their knowledge and skills in the subjects covered by integrated teaching, also through consultation of scientific literature.

COURSE SYLLABUS

Syllabus Human Anatomy

LOCOMOTOR SYSTEM. Skeleton. Axial skeleton: bones of skull, vertebral column, thoracic cage. Appendicular skeleton: pectoral girdle, upper limb, pelvic girdle and lower limb. Joints: classification and movements. Temporo-mandibular joint, sterno-clavicular joint, shoulder joint, intervertebral joint, elbow joint, radioulnar joint, wrist and hand joints. Hip joint, joint of the knee, and ankle. Muscular system. Axial musculature: muscles of the head, neck, eye, tongue, pharynx, vertebral column, diaphragm, muscles of the perineum and pelvic diaphragm. Appendicular musculature: muscle of the pectoral girdle and upper limb, muscles that move the arms and elbow. Muscles of the pelvic girdle and lower limbs: muscles that move the thigh and leg.

CARDIOVASCULAR SYSTEM. Heart, coronary circulation, thoracic aorta, abdominal aorta and their main branches. The Willis's polygon. 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 superior and inferior limbs. Portal circulation. Fetal 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, tracts, 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:

- Definition of Physiology
- Level of organization
- Body Systems
- Homeostasis

Cellular physiology:

- Transport of solutes and water across the cell membrane.
- Resting membrane potential.
- Genesis and propagation of action potential.
- Synaptic transmission.
- Neurotransmitters and Neuromodulator.

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.

Muscle Physiology:

- Functional properties of skeletal, smooth and cardiac muscle
- Excitation and contraction of skeletal muscle.
- Neuromuscular junction and excitation-contraction coupling.
- Motor unit.

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.
- The cardiac muscle and cardiac cycle.
- Cardiac output: principles of regulation of cardiac output.
- Hemodynamics: blood flow, pressure, vascular resistance and their regulation.
- Microcirculation: capillary exchange of solutes and water.

The Respiratory System:

- Organization of respiratory system.
- Mechanics of ventilation.
- Gas exchange in the lungs: diffusion of O₂ and CO₂ across the respiratory membrane.
- Transport of O₂ and CO₂ 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.

-An overview of digestive system. Functional organization of the digestive system. General principles of digestion and absorption of nutrients

- An overview of the endocrine system. Definition and classification of hormones. General characteristics of the endocrine glands and the function of their hormones.

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 teaching method includes 60 hours of frontal lessons and theoretical-practical exercises. During the lessons, illustrative images (Power-Point) will be projected, real-time 3D visual tools (Complete Anatomy), models, images of histological preparations obtained under the optical and electronic microscope and audiovisual supports will be used. During the exercises, students will be able to use anatomical models that reproduce anatomical organs and systems in a perfectly equipped classroom.

COURSE GRADE DETERMINATION

The examination of the Integrated Course of Anatomy and Physiology consists of an examination of the modules of Human Anatomy, Physiology and Histology whose grades contribute to the final score in proportion to the credits. The exam consists of a written test and an oral exam that must be passed on the same day; it is not possible to maintain the evaluation of the modules sufficient for the next exam. Only students who reach the minimum score of 18/30, for each integrated course, in the written test are admitted to the oral exam. The written test consists of 60 questions that will include the topics of all the subjects of the integrated course, weighted on the number of educational credits (30 questions of Anatomy / Neuroanatomy, 20 questions of Physiology, 10 questions of Histology). All the contents in syllabus are subject to evaluation. In evaluating the written test, the teachers reserve the right to assign penalties to questions with incorrect answers, for a maximum of 0.5 points per answer. During the oral exam, the examining commission will assess the student's ability to learn as well as the ability to apply knowledge. Will also be assessed: autonomy of judgment and communication skills. The final grade will be assigned by the Commission, collectively. The final evaluation foresees the sufficiency in all three modules of the integrated course. Students cannot pass the exam if one of the modules is not sufficient.

The evaluation criteria adopted will be the following:

Unsuitable: Poor or lacking knowledge and understanding of the topics; limited capacity for analysis and synthesis, frequent generalizations of the required contents; inability to use technical language.

18-20: Just enough knowledge and understanding of topics, with obvious imperfections; just sufficient capacity for analysis, synthesis and independent judgement; poor ability to use technical language.

21-23: Sufficient knowledge and understanding of topics; sufficient capacity for analysis and synthesis with the ability to logically and coherently argue the required contents; sufficient ability to use technical language.

24-26: Fair knowledge and understanding of the topics; discrete capacity for analysis and synthesis with the ability to rigorously argue the required contents; Good ability to use technical language.

27-29: Good knowledge and understanding of required content; good capacity for analysis and synthesis with the ability to rigorously argue the required contents; good ability to use technical language.

30-30L : Excellent level of knowledge and understanding of the required contents with an excellent capacity for analysis and synthesis with the ability to argue the required contents in a rigorous, innovative and original way; Excellent ability to use technical language.

OPTIONAL ACTIVITIES

Students will have the opportunity to carry out theoretical/practical exercises and participate in seminars. The professors will provide constant support during and after lessons.

READING MATERIALS

HUMAN ANATOMY

1) Martini Nath: Anatomy & Physiology

2) Tortora, Principles of Anatomy and Physiology

3) Tortora: Human Anatomy

Students are encouraged to use an Human Anatomy Atlas.

PHYSIOLOGY

-Principles of Anatomy and Physiology, Published by Wiley, 16th Edition Gerard J. Tortora, Bryan H. Derrickson ISBN: 978-1-119-66268-6 November 2020.

-Holes human anatomy & physiology, 15th Published by McGraw-Hill Education, David Shier, Jackie Butler, Ricki Lewis ISBN-13: 978-1259864568 Dec 14, 2022.

-Vanders Human Physiology Volume: Author(s): Eric P. Widmaier; Hershel Raff; Arthur J. Vander; Published by McGraw-Hill Education 2022

-Anatomy, Physiology, & Disease Roiger, Deborah; Bullock Ph.D., Nia Brossura Published by McGraw-Hill Education, 2022

- Color Atlas of Physiology, 7th Edition, Silbernagl, Stefan Author; Rothenburger, Astried Contributor; Despopoulos 2015.

HISTOLOGY

- "Bloom and Fawcett's Concise Histology", Don W. Fawcett, Ronald P. Jensch, William Bloom – 2nd Edition - Hodder Arnold.