

Degree Course of Physiotherapy

INTEGRATED COURSE: ANATOMY, HISTOLOGY AND HUMAN PHYSIOLOGY

CFU: 6

SSD: BIO/9, BIO/16, BIO/17

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MODULE: HUMAN ANATOMY

CFU: 3

SSD: BIO/16

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MODULE: PHYSIOLOGY

CFU: 2

SSD: BIO/09

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MODULE: HISTOLOGY

CFU: 1

SSD: BIO/17

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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

HUMAN ANATOMY

At the end of the course, the student must be able to describe the macroscopic organization of the human body, using the appropriate anatomical terminology with particular concern to the systems which the future physiotherapist will be required to have specific knowledge.

Describe the main cavities of the body, describe the individual organs of the various apparatuses and systems from a macroscopic, microscopic and topographical point of view.

PHYSIOLOGY

The role of physiotherapists is to apply their knowledge to favorite movements and to use innovative equipment in the treatment of lost physiological framework. Injuries, diseases, and disabilities represent the enemy of the human body and the aim of physiotherapists is to assist in rehabilitation by developing and restoring body systems physiology. In this light, the physiology course aims to provide the student with all the basic knowledge for understanding the functions of the human body and the mechanisms underlying these functions.

Moreover, the course aims to provide knowledge on the functional integration of the various systems and on their regulation: in physiological conditions, during homeostatic processes, and when physiological homeostasis is lost.

This knowledge will provide the student with a physiological framework necessary for understanding the disciplines that will follow in the course of studies and health interventions required in the performance of the profession.

HISTOLOGY

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

LEARNING OUTCOMES

HUMAN ANATOMY

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, cardiovascular anatomy
- basic organization of neuroanatomical structures
- the identification of specific component of the anatomical regions and their functional and physical interaction

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 pathophysiology, necessary knowledge equipment for professionals in the field of human health. The student will also use the knowledge collected to further study some specific topics required by its profession.

Communication skills

At the end of the course the student must know adequately the human anatomical structures and be able to use the specific anatomical 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 form.

Making judgements

The knowledge of human anatomy will help the student to develop a critical thinking in the ability to decide priorities and needs in response in relation to the complexity of the rehabilitation intervention.

PHYSIOLOGY

Knowledge and understanding

On completion of this course, the students will be able to

- Encompass the basis of normal human physiology with special emphasis on the functioning of the musculoskeletal, nervous, and cardiovascular systems.
- Prove an understanding of elementary human physiology.
- Recognize how abnormal Physiology affects human function and dysfunction.
- Understand the importance of maintaining homeostatic processes.

Making judgements

Upon completion of this course, the students should be able to comprehend the clinical relevance of the acquired knowledge in reference to effects in diagnosis and treatment in loss of physiological homeostasis with particular reference to the muscle-skeletal axis.

Communication skills:

The students are expected to be able to illustrate their knowledge with specific terminology and disclose the functions of the human body in relation to the acquired scientific knowledge and apply their notions to identify the " nonphysiological" dysfunction of the human body.

Making Judgements:

At the end of the course, the students are expected to be able to understand the physiology and various conditions relevant to physiotherapy and should have advanced knowledge of anatomy and histology to develop creative solutions to abstract problems.

HYSTOLOGY

Knowledge and understanding

At the end of the course the student should have acquired:

- The knowledge of the structures of the various tissues that compose the human organism
- The knowledge of the histological organization of the various human organs
- The ability to identify the morphology of the tissues, the cells that compose them, from a morphological and functional point of view
- The ability to synthesize and correlate the various topics.

Applying knowledge and understanding

At the end of the course the student should have acquired:

- The ability to apply the histology knowledge to understand other closely related branches of biology such as anatomy, cytology, physiology.

Communication skills

At the end of the course the student should:

- Use correct scientific terminology to identify, at a microscopic level, the different types of cells and tissues present in the human organism.

Making judgements

At the end of the course the student should:

- Carry out rough assessments of the topics covered.

COURSE 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. Muscular system. Axial musculature: main muscles of the head and neck, tongue, muscle of the pharynx of vertebral column, diaphragm, muscles of the perineum and pelvic diaphragm. Appendicular musculature: muscle of the pectoral girdle and upper limb, muscles that move the humerus, muscles that move the elbow, pronators and supinators. Muscles of the pelvic girdle and lower limbs: muscles that move the thigh and leg.

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 microscopic 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.

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 O_2 and CO_2 across the respiratory membrane.
- Transport of O_2 and CO_2 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.

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

HUMAN ANATOMY

The course is taught by lectures (30 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.

PHYSIOLOGY

20 Hours of frontal lessons.

HISTOLOGY

The Histology course is structured in 10 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 an examination of the modules of Human Anatomy, Physiology and Histology whose grades contributes 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 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

HUMAN ANATOMY

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

PHYSIOLOGY

In addition to the didactic activity, the student will be given the opportunity to participate in seminars and research internships. Moreover, the students will have the opportunity to conduct theoretical/practical exercises. Professors will provide support during and after the lessons.

HISTOLOGY

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

READING MATERIALS

HUMAN ANATOMY AND PHYSIOLOGY

- 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 Dec14, 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.