UNICAMILLUS

DEGREE IN MEDICINE AND SURGERY
INTEGRATED COURSE OF PHYSIOLOGY I

Module: **Physiology**

Scientific Disciplinary Sector (SDS): **BIO/09**

Number of Credits (ECTS): **9**

Professors:

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Module: **Methods and Didactics of Motor Activities**

SSD: **M-EDF/01**

CFU: **1**

Professor:

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PREREQUISITES

The treatment of the specific topics of the subject requires sufficiently detailed knowledge of Anatomy, Medical Physics, Biology and Biochemistry.

LEARNING OBJECTIVES

The course includes the acquisition by the student of knowledge of the operating principles of the organs that compose the human body, their dynamic integration into apparatus and the understanding of the general mechanisms of homeostatic function control and their variations following physical activity. The course also includes the ability to independently apply the knowledge of organ and system functioning mechanisms to potential functional alteration situations.

LEARNING OUTCOMES

1. Kknowledge and Understanding

To know and understand the physiological principles that govern the function of the organism's systems. To demonstrate the knowledge of cellular and organ functions and to acquire the ability to integrate the physiology from the cellular and molecular level to the organ and apparatus systems. To

describe the molecular and functional aspects of each organ in humans, necessary for the homeostasis maintenance. To know the adaptations of the vital functions of the human body in response to the practices of physical activity. To evaluate the consequences of alterations at the cellular and organ level in the overall functioning of the human body.

2. Applying Knowledge and Understanding

To autonomously apply the knowledge of the organ and system functioning mechanisms to situations of potential functional alteration relating to the specific field to which the student will dedicate himself in the professional activity.

3. Communication Skills

To orally present the topics in an organized and coherent way, using an adequate scientific terminology and compliant with the topic of the discussion.

4. Making Judgements

To recognize the importance of a thorough knowledge of the topics covered for an adequate medical education. To identify the fundamental role of the correct theoretical knowledge of the subject in clinical practice.

5. Learning skills

To identify the possible applications of the skills acquired in the future career and to have communication skills to convey what has been learned.

SYLLABUS

PHYSIOLOGY

Cellular and muscle physiology and of the cardiocirculatory system.

Homeostatic mechanisms and control systems. Exchanges across the cell membrane. Active and passive membrane processes. Osmosis. Cell membrane potential and equilibrium potential. Electrical properties of the cell membrane. Propagation of the electrical signal along an excitable fiber. Voltage-dependent ion channels of Na +, K + and Ca2 +. The action potential. Refractoriness of excitable membranes. Propagation of electrical signals and action potential. Electric and chemical synapses. Excitatory and inhibitory synaptic potentials. Neurotransmitters and their receptors. Signal transduction. Intracellular signals. Synaptic integration. The neuromuscular synapse. Examples of diseases related to alterations in nervous communication. Muscle physiology. Structure of the contractile apparatus of skeletal muscle. Theory of the myofilament sliding. Cycle of cross bridges and development of force. Excitation-contraction coupling. The simple and tetanic twitch. Isometric and isotonic contraction. Voltage-length and speed-load curve. Muscle power. Energy sources of

contraction. Muscular fatigue. Motor unit. Smooth muscle. Regulation and control of smooth muscle contraction. The heart muscle. Excitation-contraction coupling of the heart muscle. Mechanical and electrical activity of the heart. Phases of the cardiac cycle: pressure, volumetric and electrical aspects. The electrocardiogram. Cardiac output. Frank-Starling law. Arterial pressure, its regulation and measurement. Principles of hemodynamics. Relationship between resistance to flow, pressure, volume and viscosity of the blood. Capillaries and microcirculation. Starling's forces. The venous return. Blood circulation control. Circulation in special regions. Lymphatic circulation.

Physiology of the Nervous System.

Organization of the nervous system. Sensory receptors. Somatic sensitivities: tactile and proprioceptive sensitivity. Pain. Motor functions of the spinal cord: spinal reflexes. Control of motor function by the cerebral cortex and the brainstem. Basal nuclei and motor control. Cerebellum and motor control. Cerebral cortex and intellectual functions: language, memory and learning. Sleep-wake rhythm. Functions of the limbic and hypothalamus system. Autonomous nervous system and adrenal medulla.

Physiology of the Respiratory System.

Organization of the respiratory system. Lung ventilation. Pulmonary circulation. Alveolar-capillary gas exchange. Oxygen and carbon dioxide transport in the blood and body fluids. Ventilation and perfusion of the lungs. Breathing regulation. Adaptations of the respiratory system to physical exercise.

METHODS AND DIDACTICS OF MOTOR ACTIVITIES.

Capacity, skills and motor coordination. Energy systems, oxygen kinetics, maximum oxygen consumption and lactate. Physical activity, exercise, sedentary lifestyle. Physical fitness. Exercise testing and prescription. Adapted physical activity.

RECOMMENDED TEXTS

- Human Physiology. Sherwood. Editore: Brooks/Cole
- Medical Physiology. Guyton and Hall. Editore: Saunders
- Neuroscience. Purves. Editore: OUP USA (to be integrated for the Nervous System)
- Essentials of exercise Physiology. W.D. Mcardle, F.I. Katch, V.L. Katch, Casa Editrice Piccin

TEACHING METHOD

The course is structured in 200 hours of frontal teaching, divided into lessons of 2 or 4 hours based

on the academic calendar. Lectures will include theoretical lessons and supplementary seminars on the topics covered.

LEARNING ASSESSMENT PROCEDURES

The verification of the student preparation will take place with a written exam followed by an oral exam. The written test will consist of 30 questions with multiple choice answers, for each correct answer a point will be assigned. The final score of the written test will be given by the sum of the partial scores assigned to each question answered correctly. To access the oral exam the student must have totaled at least a minimum of 18 points. During the oral exam, the examining Commission will assess the student's learning skills as well as the ability to apply the knowledge and ensure that the skills are adequate to support and solve problems of a physiological nature (50% of the score). It will also be assessed: autonomy of judgment (25% of the score) and communication skills (25% of the score) as indicated in the Dublin descriptors.

SUPPORT ACTIVITY

In addition to the didactic activity, the student will be given the opportunity to attend seminars, research internships, laboratory attendance. The topics of the activities are not subject to examination.

STUDENT RECEPTION

The course teachers can be reached by appointment via e-mail.