



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze Psicologiche, Pedagogiche, dell'Esercizio Fisico e della Formazione		
ACADEMIC YEAR	2024/2025		
BACHELOR'S DEGREE (BSC)	PHYSICAL EDUCATION AND SPORT SCIENCES		
INTEGRATED COURSE	HUMAN PHYSIOLOGY - INTEGRATED COURSE		
CODE	03380		
MODULES	Yes		
NUMBER OF MODULES	2		
SCIENTIFIC SECTOR(S)	BIO/09		
HEAD PROFESSOR(S)	PATTI ANTONINO	Ricercatore a tempo determinato	Univ. di PALERMO
OTHER PROFESSOR(S)	PATTI ANTONINO	Ricercatore a tempo determinato	Univ. di PALERMO
CREDITS	12		
PROPAEDEUTICAL SUBJECTS	01542 - BIOCHEMISTRY		
MUTUALIZATION			
YEAR	2		
TERM (SEMESTER)	Annual		
ATTENDANCE	Not mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	PATTI ANTONINO Monday 14:00 15:00 Il ricevimento presso gli uffici di Via Giovanni Pascoli, 6. Secondo piano, stanza 9. Previa prenotazione e-mail		

DOCENTE: Prof. ANTONINO PATTI

PREREQUISITES	Knowledge of anatomy and biochemistry
LEARNING OUTCOMES	<p>The course aims to give students a comprehensive and integrated vision of the human body, its of these control systems of organs, processes that do the work and mechanisms normal conditions. The topics require studio founded by the student not solely or mainly on the ability to remember (mnemonic), but a study rational, based on an understanding of the mechanisms and processes described and the ability to to relate the knowledge acquired. The storage of data will often be obliged, for example of the values of physiological parameters of the organism, some to consider, "crucial" but will aimed at understanding of the studied processes and their control in order homeostasis, fundamental notion of physiology and below to each topic.</p> <p>At the end of the course the student must demonstrate that they understand how the various organs of the human body, their inclusion in the equipment, the general control mechanisms of these under normal conditions.</p>
ASSESSMENT METHODS	<p>The exam is an oral exam aimed at verifying the competences and skills to be acquired at the end of the course. The purpose of the questions is to verify knowledge of contents to be acquired at the end of the course, as well as analytical and expository skills. Knowledge check includes scrutiny of the capability to establish relationships between contents, theories, patterns and methodologies which have been an object of study during the course. As far as analytical skills are concerned, check will aim at verifying that the student has achieved at least one of the following goals: - make judgements and opinions about the disciplinary contents - understand applications and/or implications of the disciplinary contents within the specific discipline of reference - set the disciplinary contents within the professional, technological and sociocultural setting of reference. The student will have to answer at least three questions in the oral form about aspects of the syllabus with reference to the suggested textbooks. The exam aims at verifying knowledge and understanding of topics, interpretative competence and autonomy of judgement of concrete cases. The passing grade threshold will be considered reached if the student shows to have acquired the topics of the specific subject matter and is able to solve specific concrete cases as well as to correctly convey knowledge with satisfactory expository skills. Below the above-mentioned threshold, the exam will be considered unsatisfactory. The more the student can interact with his examiner showing mastery of language, of the specific subject matter and ability to convey his/her knowledge of the topics of the specific field of reference, the more the assessment will be positive. The latter will be expressed by 18 to 30-30 with honours marks.</p>
TEACHING METHODS	<p>Frontal lessons. Number of hours reserved for tutored activities:96 PERIOD OF LESSONS: Second year (FIRST AND SECOND HALF)</p>

**MODULE
HUMAN PHYSIOLOGY I**

Prof. ANTONINO PATTI

SUGGESTED BIBLIOGRAPHY

Cindy Stanfield Fisiologia editore Edises
W. J. Germann, C. L. Stanfield Fisiologia EdiSES, Napoli, 2006 AA. VV.

AMBIT 50097-Biomedico

INDIVIDUAL STUDY (Hrs) 108

COURSE ACTIVITY (Hrs) 42

EDUCATIONAL OBJECTIVES OF THE MODULE

The course aims to give students a global and integrated view of the human body, its organ systems, the processes that make it work, and the control mechanisms of these under normal conditions.

SYLLABUS

Hrs	Frontal teaching
5	Skeletal muscle and muscle contraction. Hill's equation. Contractile component. The elastic component in series. The elastic component in parallel. Structure of myofibrils. Structure of actin and myosin filaments. Huxley model of muscle contraction. Actin and myosin interaction and ATP hydrolysis: the biochemical cycle of ATP cleavage and the mechanical cycle of actin-myosin interaction.
4	Role of the regulatory proteins troponin and tropomyosin in the sliding of the filaments. Simple shock. Isometric and isotonic contractions. Sum of simple shocks, clonic and tetanic contractions. Force-speed relationship. Relation of tension (active and passive) and length.
6	The motor unit. Nervous mechanisms of graduation of the force of contraction (frequency and recruitment code). Mechanism of motor unit recruitment (Henneman dimension principle). Functional specialization of motor units; histochemical classification of muscle fibers; functional classification of motor units; mechanisms responsible for the functional specialization of motor units.
2	Cardiac muscle. Structural, mechanical and electrophysiological characteristics. Common characters and differences from skeletal striated muscle. Smooth muscle. Structural, mechanical and electrophysiological characteristics. Distribution and innervation. Common characters and differences from the striated muscle.
6	MOTOR FUNCTIONS General organization of motor systems (reflex movements, rhythmic automatic, voluntary). Integration of sensory information with motor commands. Motor functions of the spinal cord. Definition and general properties of somatic (skeletal muscle) spinal reflexes. The building blocks of spinal reflexes. Deep somatic reflexes (of muscle origin): reflex of the neuromuscular spindle (from stretching or myotatic); neuronal circuits involved in the stretch reflex; gamma motor neurons and their control on neuromuscular spindles; functions of the stretch reflex in the control of muscle tone and during the execution of movements. Reflex circuits activated by the Golgi muscle-tendon organ. Superficial somatic reflexes (of cutaneous origin). The flexion or nociceptive reflex: neuronal circuits and properties.
2	Spinal interneurons and properties of reciprocal innervation (simple and double). Axon reflex. Central generators of rhythmic motor patterns; notes on the spinal centers of locomotion. Consequences of the cross-section of the spinal cord: "spinal shock".
4	Motor functions of the brain stem. Anatomy-functional organization of the brain stem; ascending and descending functions of the reticular formation. Postural tone control mechanisms; decerebrate animal and extensor rigidity. Brain-trunk reflexes with particular reference to vestibular reflexes.
4	Motor functions of the cerebral cortex, basal ganglia and cerebellum. Primary motor area and secondary motor areas (supplementary motor area, premotor cortex).
1	Cerebellum: neuronal circuits of the cerebellar cortex. Role of the cerebellum in motor learning. Functional divisions of the cerebellum; main afferents and efferents of the cerebellum; functions of the vestibule, spino- and cerebro-cerebellum. Basal ganglia: anatomical composition, neuronal circuits.
2	RESPIRATORY SYSTEM Ventilation-perfusion relationship. "Average" ratio. Distribution of ventilation, perfusion and their relationship in the lungs. Causes and consequences of an altered ventilation / perfusion ratio. Physiological mechanisms of compensation. Alveolar diffusion. Factors controlling the alveolar diffusion of gases (gas properties, geometric characteristics of the alveolar-capillary membrane). Lung diffusion capacity for O ₂ (DLO ₂): meaning and methods of measurement.
2	Transport of respiratory gases in the blood. O ₂ transport - Henry's law and saturation curve of hemoglobin with oxygen. Factors that modify the affinity of hemoglobin for oxygen. CO ₂ transport. Chemical reactions of CO ₂ in the blood. Blood dissociation curve for carbon dioxide.

2	Tissue breathing. Contribution, extraction and consumption of oxygen by tissues: regulation mechanisms.
2	Breathing control. Pontine-bulb control of respiration. The genesis of the respiratory rhythm. Peripheral mechanisms. Mechanical factors (respiratory muscle receptors and related reflexes; airway receptors and related reflexes; Hering-Breuer reflex. Chemical factors (peripheral chemoreceptors and effects of PO ₂ , PCO ₂ and pH). Other factors that regulate respiration (somatic and visceral; pain; exercise; sleep). Central mechanisms - Central chemoreceptors, hints on "non-chemical" central influences.

**MODULE
HUMAN PHYSIOLOGY II**

Prof. ANTONINO PATTI

SUGGESTED BIBLIOGRAPHY

Cindy Stanfield Fisiologia editore Edises
W. J. Germann, C. L. Stanfield Fisiologia EdiSES, Napoli, 2006 AA. VV.

AMBIT	50100-Biologico
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INDIVIDUAL STUDY (Hrs)	108
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COURSE ACTIVITY (Hrs)	42
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EDUCATIONAL OBJECTIVES OF THE MODULE

The course aims to give students a global and integrated view of the human body, its organ systems, the processes that make it work and the control mechanisms of these under normal conditions.

SYLLABUS

Hrs	Frontal teaching
4	CARDIOVASCULAR SYSTEM Systemic circulation: pressure, volume, resistance and velocity in the various sections of the systemic circulation. Filling circulatory pressure and its significance. Properties of the arteries. Blood pressure: trend, determining factors, measurement and direct recording; indirect measure; wrist arterial. Properties of the veins, central venous pressure, venous pulse, venous return.
4	Microcirculation: organization of the capillary network, mechanisms of exchanges at the level of the capillaries, lymphatic drainage, local flow control, self-regulation. Cardiovascular control mechanisms: generalities on control systems (negative feedback). Nerve centers of cardiovascular control. Reflex nerve control of blood pressure (short term), arterial baroreceptors, atrial and pulmonary artery receptors, chemoreceptors, VNS actions, humoral control, and renal control (long term).
6	Cardiac output and venous return. Methods of measurement of cardiac output. Franck - Starling mechanism and intrinsic regulation of cardiac output, extrinsic regulation. The pressure gradient of the venous return. Curves of cardiac output and venous return as a function of right atrial pressure. District circles: coronary, cerebral, cutaneous, muscular, heptosplanchnic, renal circulation.
6	BODY LIQUIDS AND KIDNEY FUNCTION The fluids of the organism. Total body water. Water balance. The liquid compartments of the organism and their measurement. Constituents of extracellular fluid (LEC) and intracellular. (LIC). Maintenance of the osmotic balance between extracellular and intracellular fluids. Functional anatomy of the kidney. Renal circle. Functions of the nephron. Urine formation: glomerular filtration, tubular function and plasma purification. Glomerular filtration. Glomerular filtration rate (VFG). Factors Affecting VFG.
4	Concept of "plasma clearance". Inulin clearance as a measure of glomerular filtration rate. The clearance of paraminoippuric acid (PAI) as a measure of blood flow through the kidneys. Tubular function. Mechanisms of reabsorption and tubular secretion. Reabsorption and secretion of various substances in the different segments of the tubules. Tubular transport of glucose, amino acids, urea, uric acid, Na ⁺ , K ⁺ , phosphates, HCO ₃ ⁻ and H ⁺ . Water reabsorption. Renal mechanisms for the concentration and dilution of urine.
4	Action of ADH. Role of the kidney in controlling osmolarity, volume and composition of blood and extracellular fluid. Fundamental mechanisms for volemia and osmolarity control. Control of the concentration of Na ⁺ in the extracellular fluid. Control of the extracellular concentration of K ⁺ . Control of the extracellular concentration of other ions. Regulation of acid-base balance. The buffer systems of body fluids. Respiratory regulation of acid-base balance. Renal regulation of hydrogen ion concentration. Correction of alkalosis and acidosis by the kidney. Urination. The reflex of urination.
6	THE DIGESTIVE SYSTEM Functions and processes of digestion, gastrointestinal absorption, and control. Caloric and non-caloric nutrients. The needs. The energy balance.
6	THE ENDOCRINE SYSTEM Adrenal glucocorticoids, thyroid hormones, growth hormone, insulin, and glucagon
2	THERMOREGULATION