



UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Biomedicina, Neuroscienze e Diagnostica avanzata		
ACADEMIC YEAR	2020/2021		
BACHELOR'S DEGREE (BSC)	MEDICAL AND IMAGE DIAGNOSTICS AND RADIOTHERAPY TECHNIQUES		
INTEGRATED COURSE	HISTOLOGY, ANATOMY, BIOCHEMISTRY AND PHYSIOLOGY - INTEGRATED COURSE		
CODE	15285		
MODULES	Yes		
NUMBER OF MODULES	3		
SCIENTIFIC SECTOR(S)	BIO/16, BIO/09, BIO/10		
HEAD PROFESSOR(S)	SARDO PIERANGELO	Professore Ordinario	Univ. di PALERMO
OTHER PROFESSOR(S)	EMANUELE SONIA	Professore Associato	Univ. di PALERMO
	SARDO PIERANGELO	Professore Ordinario	Univ. di PALERMO
	CARUSO BAVISOTTO	Ricercatore a tempo determinato	Univ. di PALERMO
	CELESTE		
CREDITS	12		
PROPAEDEUTICAL SUBJECTS			
MUTUALIZATION			
YEAR	1		
TERM (SEMESTER)	1° semester		
ATTENDANCE	Not mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	EMANUELE SONIA		
	Thursday	11:00 - 13:00	Sezione di Biochimica, Dipartimento BioNeC, Policlinico, via del Vespro 129 90127 Palermo
	SARDO PIERANGELO		
	Monday	09:30 - 10:30	BiND- Sezione di Fisiologia umana - Corso Tukory, 129 - II piano
	Friday	09:30 - 10:30	BiND- Sezione di Fisiologia umana - Corso Tukory, 129 - II piano

DOCENTE: Prof. PIERANGELO SARDO

PREREQUISITES	Elements of Chemistry, Physics and Biology.
LEARNING OUTCOMES	<p>Knowledge and ability to understand the anatomical and biochemical basis and functions of different organs and systems of the human body, even including some specific advanced topics in the field.</p> <p>Knowing the molecular, cellular, biochemical and physiological mechanisms that maintain the homeostasis of the organism.</p> <p>Making judgments</p> <p>Being able to formulate hypotheses, collect and critically evaluate data, to solve problems.</p> <p>Being able to formulate personal judgments to solve analytical and critical problems ("problem solving") and being able to independently search for scientific information, without waiting for it to be provided to them.</p> <p>Enable communication</p> <p>Interact with other professionals involved in patient care through an efficient teamwork.</p> <p>Ability of applying the knowledge of the principal regulatory mechanisms of organs' and systems' functions, as well as their integrative actions. Ability to collect and interpret data considered useful to inform judgments on basic aspects of the disciplines of the course. Ability to communicate information, ideas, problems and solutions related to the same disciplines. Development of learning skills useful to progress in studying further disciplines of the Degree Course.</p>
ASSESSMENT METHODS	<p>The student should answer at least three questions posed orally, about all arguments covered by the program of each teaching module, with reference to both the recommended books and the information provided during the lessons of the course. The final assessment aims to evaluate whether the student knows and understands the topics, as well as whether he/she has interpretative ability about the normal structure, biochemistry and physiological functions and their parameters. The evaluation is expressed using a 30-point scale. ECTS grades: A – A+ Excellent (30-30 cum laude) - Grade descriptors: Excellent knowledge of teaching contents; students should show high analytical and synthetic capabilities and should be able to apply their knowledge to solve highly complex problems. ECTS grade: B Very good (27-29) - Grade descriptors: Good knowledge of the teaching contents and excellent language control; students should show analytical and synthetic skills and be able to apply their knowledge to solve problems of medium and, in some cases, even higher complexity. ECTS grade: C Good (24-26)- Grade descriptors: Good knowledge of teaching contents and good language control; the students should be able to apply their knowledge to solve problems of medium complexity ECTS grade: D Satisfactory (21-23)- Grade descriptors: Average knowledge of the teaching contents, in some cases limited to the main topic; acceptable ability to use the specific discipline language and independently apply the acquired knowledge. ECTS grade: E Sufficient (18-20) - Grade descriptors: Minimum teaching content knowledge, often limited to the main topic; modest ability to use the subject specific language and independently apply the acquired knowledge. ECTS grade: F Fail (1-17) - Grade descriptors: Lack of an acceptable knowledge of the main teaching content knowledge; very little or no ability to use the specific subject language and apply independently the acquired knowledge. Exam failed.</p>
TEACHING METHODS	Lessons

MODULE HUMAN PHYSIOLOGY

Prof. PIERANGELO SARDO

SUGGESTED BIBLIOGRAPHY

Pietro Scotto – Fisiologia – Poletto Editore
 AA vari – Fisiologia dell'uomo - Edi-Ermes
 SILVERTHORN "FISIOLOGIA: un approccio integrato. Casa editrice Ambrosiana
 Linda S. Costanzo - Fisiologia - Edra
 Per eventuali approfondimenti:
 Fisiologia umana. A cura di F. Grassi, Daniela Negrini e A. Porro. Poletto Editore
 Fisiologia medica . Di Boron, Boulpaep. Edra

AMBIT	10338-Scienze biomediche
INDIVIDUAL STUDY (Hrs)	45
COURSE ACTIVITY (Hrs)	30

EDUCATIONAL OBJECTIVES OF THE MODULE

Knowledge of blood, cardiovascular, respiratory, renal, gastro-intestinal, endocrine and nervous (central and peripheral) functions.

SYLLABUS

Hrs	Frontal teaching
2	Composition and distribution of body fluids. Biophysics of the cell membrane. Flow, equilibrium, steady state, active and passive transport. Ion channels: passive and active (ligand dependent, voltage gated, mechanically gated). Mechanisms of diffusion and selective permeability: mechanisms leading to the development of osmotic forces, consequences on the electrolyte balance of the cell (balance of Gibbs - Donnan). Electric characteristic of the cell. Ionic bases of the membrane potential in the resting cell; the equilibrium potential for a single ion species. Role of the Na ⁺ / K ⁺ pump. Propagation of local potentials. Excitable membranes. Time course of the action potential: correlation with variations of cell membrane permeability. Electric threshold; factors influencing cell excitability. Propagation of the action potential (continuous or saltatory).
2	Blood. Plasma and plasma proteins. Red blood cells. Hemolysis, globular resistance. Blood groups and Rh factor. Platelets. Hemostasis and coagulation. White blood cells. Erythrocyte sedimentation rate (ESR).
4	Cardiovascular system. Features of myocardial tissue: excitability (bathmotropism), rhythmicity (chronotropism), conductivity (dromotropism), contractility (inotropism), relaxation rate (lusitropy). Bioelectric characteristics of "common" and "specific" myocardial tissue: action potential, prepotential or pacemaker potential. Propagation of impulses in the heart. Relationship between electrical and mechanical events. Electrocardiogram: basic features and interpretation. Mechanical events of the cardiac cycle. Phases and duration of the cardiac cycle. Heart sounds . Biophysical features of the myocardial fibers. The Starling's "heart-lung preparation" and the Maestrini - Starling Law. Action of extrinsic innervation (ortho-sympathetic and parasympathetic) on the heart performance. Cardiac output. Factors affecting cardiac output.
3	Bloodstream: laminar and turbulent flow. Variations of blood pressure and the speed in the vascular arterial, capillary and venous sections. Blood arterial pressure: definition and determinants, systolic and diastolic arterial blood pressure, differential (systolic) and average pressure. Methods of measurement in humans. Regulation of blood pressure. Capillary circulation and exchanges. Functions of peripheral lymphatic vessels. Venous circulation. Return of blood to the heart .

4	<p>Respiratory system. Ventilation. Upper airways. Respiratory muscles and movements. Pneumothorax. Lung volumes and capacities. Pulmonary and alveolar ventilation, anatomical and physiological dead space. Gas exchange between the lungs and the external environment. Gas physic laws. Composition of inhaled , exhaled and alveolar air, respiratory gas partial pressures. Diffusion of gases between lungs and blood. Alveolar ventilation - perfusion mismatch . Transport of gases in the blood: oxygen transportation and content, hemoglobin dissociation curves, fetal hemoglobin and myoglobin features. CO2 transportation. Nervous and chemical control of ventilation: control of spinal respiratory motor neurons; pontine and bulbar respiratory nuclei and centers. Reflex mechanisms of respiratory control. Genesis of the respiratory rhythm. Peripheral carotid and aortic chemoceptor reflex. Central chemoceptors.</p>
3	<p>Renal tract. Glomerular ultrafiltration: ultrafiltrate rate and composition. Renal clearance: the clearance of inulin as a measure of glomerular filtration rate. Tubular reabsorption: assessment of the maximum tubular transport (TMG) . Renal threshold for glucose reabsorption. Glycosuria : diabetes mellitus and renal diabetes. Reabsorption of Na + and Cl- in the proximal and distal portions of the nephron. Tubular reabsorption of water. Osmotic and water-induced diuresis .</p>
5	<p>Interneuronal and cyto-neural communication. Electric and chemical synapses. Anatomical and functional characteristics of excitatory and inhibitory synapse. Post-synaptic excitatory and inhibitory potentials. Release of neurotransmitters. Postsynaptic ionoforic and metabotropic receptors. Sensory receptors: general concepts and classification; transduction and adaptation. Spinal cord: functional organization, spinal reflexes. Peripheral and central somesthesia (tactile, thermal, to pain). Somesthetic cerebral cortex. Motor control: anatomical and functional framework of the descending motor systems; the pyramidal tract. Cortical areas for motor planning, programming and execution. The anatomo-functional organization of circuits controlling motor cortical areas: a) circuits passing through the cerebellum b) circuits passing through the basal ganglia.</p>
4	<p>Endocrine system. Categories and mechanisms of action of hormones. Specific effects of hormones on target organs and systems: hypothalamic and adeno - pituitary hormones, feedback mechanisms controlling e hypothalamus-pituitary dependent endocrine glands; thyroid and parathyroid hormones; hormones of the adrenal cortex and medulla; sex hormones; hormonal growth control; hormonal control of blood glucose; hormonal control of serum calcium.</p>

MODULE
HUMAN ANATOMY WITH ELEMENTS OF HISTOLOGY

Prof.ssa CELESTE CARUSO BAVISOTTO

SUGGESTED BIBLIOGRAPHY

Anatomia del Gray – Le basi anatomiche della pratica clinica – Elsevier 2009;
Testo Atlante di Anatomia – Prometheus - E. Gaudio (a cura di)– Edises seconda edizione;
Martini F.H., Timmonds M.J., Tallitsch R.B.: Anatomia Umana - Edises Quinta Edizione– 2012;
Anatomia dell'apparato locomotore - Farina F. (a cura di) – Elsevier.

AMBIT	10338-Scienze biomediche
INDIVIDUAL STUDY (Hrs)	90
COURSE ACTIVITY (Hrs)	60

EDUCATIONAL OBJECTIVES OF THE MODULE

The overall objective of the module is to provide a systematic and topographic anatomical overview of the structure of the walls of the cavities and of their organs. The specific aim is to achieve a good level of knowledge on the macroscopic and microscopic characteristics of the human body.

SYLLABUS

Hrs	Frontal teaching
2	General features and terminology.
2	Epithelial tissue, connective tissue, muscle tissue and nervous tissue.
2	Musculoskeletal system: general features.
2	Spine
2	Skull.
2	Chest wall.
6	Upper limb.
4	Lower limb.
8	Thoracic organs.
4	Organs of the neck.
12	Organs of the abdominal and pelvic cavities.
2	Splanchnic portion of the head.
2	Spinal cord.
2	The brain stem.
2	Cerebellum.
2	Telencephalon and Diencephalon.
2	Motor and sensory pathways.
2	Eye and ear.

MODULE BIOCHEMISTRY

Prof.ssa SONIA EMANUELE

SUGGESTED BIBLIOGRAPHY

Biochimica Medica: Siliprandi Tettamanti, ed. Piccin.

Corso di Biochimica per lauree triennali: Samara, ed. Piccin

Appunti di Biochimica per lauree triennali: Catani, Savini, Guerrieri, Avigliano. Ed. Piccin

AMBIT	10338-Scienze biomediche
INDIVIDUAL STUDY (Hrs)	45
COURSE ACTIVITY (Hrs)	30

EDUCATIONAL OBJECTIVES OF THE MODULE

The biochemistry module aims to give the key to understand the chemical and biologic context regarding molecules, reactions and metabolic pathways. In particular, it aims to underline the relationship between structure and function of the principal classes of molecules and regulation of metabolic processes.

SYLLABUS

Hrs	Frontal teaching
3	Significance of studying biochemistry. Introduction on metabolism: catabolic and anabolic reactions. Key molecules in metabolism: ATP, NAD/NADH, NADP/NADPH, AcetylCoA (structure and functions)
4	Enzymes: generality. Enzymatic catalysis. Active site. Specificity, affinity, catalytic power. Isoenzymes. Enzymatic Kinetics: Cinetica enzimatica: Michaelis-Menten constant. Enzymatic inhibition. Enzymatic activity regulation. Allosterism. Covalent modifications. Co-enzymes and prosthetic groups.
8	Carbohydrates metabolism: glucose uptake in the cells. Glucose phosphorylation. Hexokinase and glucokinase. Metabolic destinies of 6p-glucose. Glycemia regulation. Glycolysis in the presence or absence of oxygen. Metabolic destinies of pyruvic acid. Cori cycle. Gluconeogenesis. Glycogen metabolism: glycogenolysis and glycogen synthesis. Krebs cycle.
2	Oxidative phosphorylation. Significance of reducing equivalents. Biologic redox chain. Q coenzyme, cytochromes. ATP synthase. Phosphorylation at the substrate level.
7	Lipid Metabolism. Metabolic utilization of fatty acids. Triglycerides as a source of oxidizable fatty acids. Beta oxidation of fatty acids. Synthesis of fatty acids. Triglycerides metabolism. Lipoprotein: generality. Destiny of chylomicrons and VLDL. LDL receptors. Atherosclerosis. Ketone bodies metabolism. Ketosis and ketoacidosis.
1	Metabolic adaptation to fast condition.
3	General amino acids metabolism, catabolism, transamination. Oxidative deamination. Metabolic destiny of ammonia. SAM. Catecholamines. Serotonin, glutathione.
2	Hormones: general classification. Signal transduction mechanisms. Cyclic AMP pathway and phosphoinositides. Glucocorticoids.