

PsGeneral information	
Academic subject	NUTRITION SCIENCE FOF HUMAN HEALTH
Degree course	Master's Degree in Nutrition Sciences for Human Health (LM-61)
Academic Year	Second
European Credit Transfer and Accumulation System (ECTS)	3
Language	Italian
Academic calendar (starting and ending date)	First semester october 4, 2021 – january 22, 2022
Attendance	Mandatory attendance

Professor/ Lecturer	
Name and Surname	Lucantonio Debellis
E-mail	lucantonio.debellis@uniba.it
Telephone	3402469943
Department and address	Department of Biosciences, Biotechnologies and Biopharmaceutics Campus in Via E. Orabona, 4 - Biological dept. building; floor -1 St. 26
Virtual headquarters	
Tutoring (time and day)	From Monday to Friday with previous e-mail appointment

Syllabus	
Learning Objectives	The course aims to provide knowledge on the physiology of organs, apparatuses and systems, mainly in relation to nutritional and metabolic function; on physiological and functional aspects of the digestive system and the processes that make it possible to modify and use the food material through the digestion and absorption of food; on the nutritional significance of the diet; on the neuroendocrine mechanisms involved in the control of eating behavior.
Course prerequisites	Basic knowledge of Physics, General and Organic Chemistry, Biochemistry, Human Anatomy and General Physiology.
Contents	<ul style="list-style-type: none"> • Feeding and Nutrition <ul style="list-style-type: none"> – Primary biological needs of living beings; feeding and nutrition; autotrophic and heterotrophic organisms; foods and nutrients; biological role of nutrients; the replacement; biological work; matter and energy; homeostasis and life stages. • Central nervous system <ul style="list-style-type: none"> – General organization of the nervous system; Development and plasticity of the nervous system; Recalls on bioelectrical potentials. Cellular irritability and excitability. Synapses and classes of neurotransmitters. • Brain areas and their roles <ul style="list-style-type: none"> – Structure of the cerebral cortex. – Primary and secondary sensory cortical areas; associative areas: motor areas. – Connections between brain areas and their functions. • Sensory perceptions <ul style="list-style-type: none"> – Psychophysics of sensory perception and relationships with nutritional function. General properties of receptors, transduction of stimuli, encoding of the intensity, duration and localization of the stimulus; role of the encoder; adaptation; tonic and phasic receptors; receptive field; discrimination. – Somatosensory receptors: tactile; proprioceptors; thermoreceptors; nociceptors and peripheral and central modulation of pain perception; primary and higher-order sensory cortical areas. Vision: eye and optical means; photoreceptors; cortical



projections and role of the visual cortex. Hearing: structural and functional characteristics; auditory cortical areas; verbal communication. Taste: gustatory sensations, gustatory indices; receptors and translation of gustatory stimuli; cortical areas of taste. Smell: osmophoric substances; olfactory epithelium; translation of odorous stimuli; olfactory cortical areas.

– Effects of sensory perception on eating behavior.

- **Learning and memory**

– Role of learning and memory; brain structures involved; non-associative learning (habituation and sensitization); associative learning (classical-Pavlov, operant-Skinner); classification of forms of memory; cellular models of construction and stabilization of mnemonic contents.

- **Motion control**

– Skeletal muscle: characteristics and function.
– Muscle, tendon and vestibular receptors.

Cortical areas of motor control; functional and hierarchical organization of motor systems.

- **Organization and control of the autonomous functions of the body**

– Motivations, emotions and structures involved in controlling direct and indirect responses.

– Autonomous Nervous System: structural and functional characteristics of orthosympathetic, parasympathetic, adrenal medulla.

– Hypothalamus: functional characteristics and interactions with the endocrine system.

– The endocrine organs and their function.

– Control and regulation of motivation; Limbic system; Diffuse stem-brain modulatory systems; – Brain mechanisms of reward and addiction.

– Circadian rhythms and control structures; sleep-wake cycle.

– Emotional states; primary emotions; physiological changes and behavioral responses in emotional states. Characteristics and role of the amygdala.

– The regulation of eating behavior: Hunger appetite satiety Systems for regulating the state of nutrition in the short and long term; paraventricular, lateral and arched hypothalamic nuclei. Melanocortin system, oroxygenic and anorexigenic control; Peripheral signals satiety and adiposity.

- **Digestive apparatus**

– Components and roles of the digestive system; hints of functional anatomy. Vascularization and innervation of the digestive system.

– Mouth and esophagus: teeth; chewing and swallowing, esophageal motility, salivary secretion and its control.

– Stomach: characteristics and functions; gastric motility and its control; gastric acid and peptic secretion (cellular mechanisms), neuro-hormonal control of gastric secretion; mucosal barrier and gastric protection; gag reflex.

– Exocrine pancreas: characteristics and functions; saline and enzymatic exocrine secretion; enzymatic activation; regulation of pancreatic secretion.

– Liver: metabolic characteristics and functions, liver detoxification; biliary secretion, enterohepatic circulation.

– Gallbladder, structure and functions; concentration of cystic bile; cholelithiasis; bile release regulation.

– Small intestine; motility of the small intestine (segmentation and peristalsis); structure of the intestinal wall and villi; absorbent surface; saline and enzymatic secretion; principles of intestinal absorption. Duodenum, Fasting, Ileus: secreting and absorbing characteristics and functions.

– Digestion and absorption of: carbohydrates, proteins (chemical and biological value of



proteins), lipids (characteristics and roles of lipoproteins), vitamins, water, sodium, potassium, chlorine, calcium, magnesium, iron.

– Large intestine: cecum and colon: structure, functions and alterations; secretory and absorbent function. Colorectal motility; composition of feces; mechanism of defecation; frequency of the hive.

– Intestinal microbiota: characteristics and roles in the body's homeostasis. – Lymphoid tissue associated with the digestive system: characteristics and functions, relationships with the functions of the immune system.

– Transport of nutrients from blood to cells: Starling's forces.

• **Respiratory System**

– Functions and features; relationship with the circulatory system; respiratory membrane and diffusion laws.

– Pulmonary ventilation: phases, structures and forces involved; spirometry; lung volumes and capacities. Diffusion exchange of O₂ and CO₂ gases; composition of the alveolar air. Blood transport of O₂ and CO₂; hemoglobin.

– Nervous and chemical control of respiration: bulbopontine centers, aortic and carotid chemoreceptors.

– Respiratory and metabolic acidosis and alkalosis.

• **Cardio-circulatory and lymphatic system**

– Blood: plasma and blood corpuscle component. Lymph.

– Heart; cardiac automatism; cardiac output. Venous return. Blood pressure control.

– Characteristics and functions of the small and large circulation, arteries, arterioles, capillaries, veins and lymphatics.

• **Excretory system**

– Water compartments of the organism.

– Structure of the kidney and urinary system.

– Glomerular filtration and its self-regulation. Reabsorption and tubular secretion. Clearance. Maximum transport. Renal threshold of excretion.

– Concentration and dilution of urine. Regulation of diuresis. Renin-angiotensin-aldosterone system.

– Acid-base balance of the organism. Biological buffer systems. Respiratory and renal regulation.

• **Evaluation of nutritional needs**

– Energy expenditure and needs; basal metabolic rate; direct and indirect calorimetric techniques; assessment of energy expenditure; allometry of metabolism; body composition; methods for determining the fat and lean mass (anthropometry, plicometry, hydrostatic weighing, impedance measurement, adipometry, DEXA, K40); body weight; body mass index; Body constitution; body mass index; energy requirements; physical activity; analytical determination of metabolism and energy requirements; energy content of food; calorimetric bomb; energy requirements.

• **Laboratory**

1. Analytical determination of the basal metabolic rate by means of various predictive formulas.

2. Evaluation of basal metabolism by indirect calorimetry.

3. Assessment of body composition by means of anthropometric measurements and plicometry.

4. Assessment of body composition by impedance and adipometry.

Books and bibliography	<p>A. Teaching materials distributed during the course</p> <p>B. "ALIMENTAZIONE, NUTRIZIONE E SALUTE" di L. Debellis et al. - Ed. EdiSES.</p> <p>C. "FISIOLOGIA dalle molecole ai sistemi integrati" di E. Carbone et al. – 2nd ed. - Ed. EdiSES</p> <p>D. "FISIOLOGIA - Vol. 1 Molecole, cellule e sistemi - Vol. 2 Funzione d'organo e integrazione sistemica" - E. D'Angelo et al. – Ed. Edi.Ermes</p> <p>E. "VANDER – FISIOLOGIA" - EP Widmaier, H Raff, KT Strang – 2nd ed. - Ed. Zanichelli.</p> <p>F. Articles from scientific journals proposed during the course.</p>
Additional materials	

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
Hours			
76	64	12	149
ECTS			
9	8	1	
Teaching strategy	The teaching modality will be that of "blended learning": mixed frontal and remote teaching at the same time.		
Expected learning outcomes			
Knowledge and understanding on:	<ul style="list-style-type: none"> • Knowledge of the characteristics and functions of the organs, systems and systems of the human body, in order to understand the causes, conditions and laws that determine and regulate vital phenomena, the functioning of the organism and its interactions with the environment. • Understanding of the relationships between the humoral, sensory, cognitive and motivational aspects correlated with body homeostasis and relationship life, with particular reference to the characteristics and role of the digestive system and the processes that make it possible to modify and use the food material through digestion and absorption of food. • Knowledge of analytical and instrumental methods for evaluating nutritional status and body composition. 		
Applying knowledge and understanding on:	<p>Ability to apply the knowledge acquired in order to:</p> <ul style="list-style-type: none"> • Identify the functional significance of each body organ, its role in relation to the maintenance of homeostasis and health status. • Identify the role and nutritional characteristics of foods in relation to the need for specific nutrients for maintaining homeostasis and health. • Identify the relationships between the sensory, cognitive, motivational, and psychic aspects capable of influencing eating behaviour and therefore the state of health. • Correctly assess the nutritional needs of different individuals in the different stages of life and normal or pathological conditions. • Promote nutritional education. 		
Soft skills	<ul style="list-style-type: none"> • <i>Making informed judgments and choices</i> Developed through lectures and in-depth study of scientific texts and articles, it must lead the student to be able to critically evaluate the role of the various systems and organs in maintaining homeostasis and health. The student must be able to understand, analyse and evaluate the scientific and popular literature concerning the physiology of nutrition. 		

	<ul style="list-style-type: none"> • <i>Communicating knowledge and understanding</i> Developed through comparison during lessons, it must lead the student to be able to describe the knowledge relating to the functioning of the human organism, its interactions with the environment and in particular the role of nutrition with simplicity and effectiveness. • <i>Capacities to continue learning</i> Developed through the study and deepening of the bibliography, in order to perfect the learning ability from highly complex technical-scientific texts, monographs, scientific periodicals, informatic tools and databases in the physiological and nutritional field..
--	---

Assessment and feedback	
Methods of assessment	Ongoing oral assessment - Oral exam
Evaluation criteria	<ul style="list-style-type: none"> • <i>Knowledge and understanding</i> Ability to correctly identify the specific problems proposed and capacity to organize knowledge. • <i>Applying knowledge and understanding</i> Level of knowledge and understanding related to the teaching contents. • <i>Autonomy of judgment</i> Ability to develop a critical and functional reasoning and to argue on specific proposed problems. • <i>Communicating knowledge and understanding</i> Ability to report, in a clear way and using an adequate vocabulary, the contents of the course and other acquired knowledge and to argue on specific problems proposed. • <i>Communication skills</i> Effectiveness in answering questions
Criteria for assessment and attribution of the final mark	The final grade is awarded out of thirty. The exam is passed when the grade is greater than or equal to 18.
Additional information	