PsGeneral information		
Academic subject	**PHYSIOLOGY OF HUMAN NUTRITION** (Course module integrated with Pediatrics, for a total of 9 CFU)	
Degree course	Master's Degree in Biomedical Sciences (LM/6) - Nutritional curriculum	
Academic Year	Second	
European Credit Transfer and Accumulation System (ECTS)		4
Language	Italian	
Academic calendar (starting and ending date)	Second semester march 1, 2022 – june 10, 2022	
Attendance	Mandatory attendance	

Professor/ Lecturer	
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Virtual headquarters	
Tutoring (time and day)	From Monday to Friday by previous e-mail appointment

Syllabus	
Learning Objectives	The course aims to provide in-depth knowledge of the physiological and functional aspects of the digestive system and of the processes that make it possible to modify and use the food material through the digestion and absorption of food; knowledge of the nutritional significance of the diet; study of 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	• **Living Beings and Nutrition** – Primary biological needs of living beings; nutrition; autotrophic and heterotrophic organisms; food and nutrition; foods and nutrients; replacement; homeostasis and life stages; matter-energy-nutrition relationship; biological work; energy expenditure and needs; body composition; methods for determining the fat and lean mass (plicometry, hydrostatic weighing, bioimpedance analysis, adipometry, DEXA, K40); body weight; body mass index; body constitution; analytical determination of metabolism and energy requirements; energy content of food. • **Food and Nutrients** – Food groups and nutritional characteristics: Water; characteristics of low-mineral and mineral waters; residue; hardness; saline content. Energy foods and energy content assessment. Foods providing carbohydrates; glycemic index, dietary fiber. Foods carrying lipids. Protein-bearing foods, biological value and chemical score; complementarity; digestibility; states of protein deficiency. Vitamin, water-soluble and fat-soluble foods. Foods that bring mineral salts. Nerve foods. – Nutraceutical or functional foods: characteristics, claims, safety. Supplemented, fortified, dietetic foods, food supplements. GMO characteristics and problems. – INRAN guidelines for nutrition and recommended intake levels of nutrients,

	frequency, quantity and quality of daily meals; nutrition in particular physiological conditions: childhood, adolescence, sports, senescence, pregnancy, breastfeeding. • **Sensory perception related to nutrition** – Eating behavior and nervous system; man-food relationship; role of sensory perception. – Taste system: gustatory sensations, gustatory indices; receptors and stimulus translation; perception of bitterness and correlation; sweeteners; lipid receptor. – Olfactory system: osmophoric substances; olfactory epithelium; translation of odorous stimuli; relationship between the perception of odors and the emotional system; relationship with mood. • **Physiology of the digestive system** – Components and roles of the digestive system. – Outline of functional anatomy, splanchnic circulation, structure and innervation of the gastrointestinal wall, nervous control of motility; basic electric rhythm. – Mouth: teeth; chewing and swallowing, esophageal motility, salivary secretion, functions and composition of saliva, nervous control of salivary secretion. – Stomach: characteristics and functions; gastric motility and its control; gastric emptying; gastric acid and peptic secretion (cellular mechanisms), neuro-hormonal control of gastric secretion; mucosal barrier and gastric protection; gag reflex; gastric ulcer; Helicobacter pylori. – Exocrine pancreas: characteristics and functions; saline and enzymatic exocrine secretion; enzymatic activation; neuro-hormonal regulation of pancreatic secretion. – Liver: characteristics and functions; liver detoxification; bilirubin; biliary secretion, enterohepatic circulation – Gallbladder, structure and functions; concentration and release of cystic bile; cholelithiasis. – Small intestine; structure and motility of the small intestine (segmentation and peristalsis); intestinal villi; enterocytes; secretory function of the small intestine; principles of intestinal absorption. – Duodenum, Fasting, Ileus: characteristics and functions. – Digestion and absorption of carbohydrates, proteins and lipids. Characteristics and roles of lipoproteins; endothelial damage. – Absorption of water-soluble and fat-soluble vitamins, water, sodium, potassium, chlorine, calcium, phosphates, magnesium, iron. – Large intestine: cecum and colon: structure, functions and alterations; secretory and absorbent function. – Intestinal microflora and lymphoid tissue associated with the digestive system: characteristics and functions, relations with the functions of the immune system, defense against exogenous bacteria, digestion of some indigestible nutrients; probiotic and prebiotic foods. – Colorectal motility; composition of feces; mechanism of defecation; frequency of the alvus and pharmacological aids for regulation. – Transport of nutrients from blood to cells: Starling's forces. – Notes on the main digestive pathologies: Reflux, Esophagitis, Gastritis, Hepatitis, Cholelithiasis, Intestinal inflammation, Diabetes, Colitis, Dysbiosis.

	• **Adverse reactions to food** – Characteristics and classification of adverse reactions to food. – Toxic reactions to food; Characteristics and sources of xenobiotics in food; liver detoxification; bioavailability of toxic residues in food; risk assessment (DL50, DGA, NOAEL SF); Maximum residual limit and related problems; Examples of toxins of bacterial, plant, animal and anthropogenic origin. – Non-toxic reactions to food; Food allergies: gastrointestinal and systemic symptoms; conventional diagnostics and treatment; Notes on celiac disease; Food intolerances: characteristics and conventional diagnostics. Problems of unconventional diagnostics.
Books and bibliography	A. Teaching materials distributed during the course B. "ALIMENTAZIONE, NUTRIZIONE E SALUTE" di L. Debellis et al. - Ed. EdiSES. C. "FISIOLOGIA dalle molecole ai sistemi integrati" di E. Carbone et al. – 2nd ed. - Ed. EdiSES D. Articles from scientific journals proposed during the course.
Additional materials	

Work schedule			
Total	Lectures	Hands on (Laboratory, working groups, seminars, field trips)	Out-of-class study hours/ Self-study hours
Hours			
32	32	0	68
ECTS			
4	4	0	

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:	• Physiological and functional aspects of the sensory and digestive system and of the processes that make it possible to identify and evaluate the characteristics of food and subsequently modify and use the food material by digesting food and absorbing nutrients. • Physiological and body elements related to nutritional needs and of the characteristics of the nutrients that satisfy these needs. • Relationships between humoral, sensory, cognitive, motivational, and psychic aspects capable of influencing eating behaviour and therefore the state of health. • Most common problems that link nutrition and state of health.
Applying knowledge and understanding on:	• Identify the physiological aspects related to nutrition and inherent the role of the digestive system and other organs and body systems. • Identify the role and nutritional characteristics of foods in relation to the need for specific nutrients for maintaining homeostasis and health. • Correctly assess the nutritional needs of different individuals at different stages of life and normal or pathological conditions. • Identify the relationships between the sensory, cognitive, motivational, and psychic aspects capable of influencing eating behaviour and therefore the state of health. • Promote nutritional education.

Soft skills	• *Making informed judgments and choices* Developed through lectures and in-depth study of scientific texts and articles, it must lead the student to be able to evaluate the need for specific nutrients for maintaining homeostasis and health, the nutritional qualities of foods and the impact on health of eating behaviors. • *Communicating knowledge and understanding* Developed through comparison during lessons, it must lead the student to be able to describe the knowledge relating to the nutritional needs of the individual, and to the systems of the human body related to nutrition and maintenance of health. • *Capacities to continue learning* 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, regarding the nutrition.

Assessment and feedback	
Methods of assessment	Ongoing oral assessment - Oral exam
Evaluation criteria	• *Knowledge and understanding* Correctly identify the specific problems proposed and capacity to organize knowledge. • *Applying knowledge and understanding* Knowledge and understanding adequate to the teaching contents. • *Autonomy of judgment* Critical and functional reasoning to argue on specific proposed problems. • *Communicating knowledge and understanding* 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. • *Communication skills* 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. The grade in the module of Physiology of human nutrition will contribute, by means of a weighted average with the grade of the Endocrinology module, to determine the overall grade of the Integrated Course.
Additional information	