UNIVERSITÀ DEGLI STUDI DI PALERMO

DEPARTMENT	Scienze e Tecnologie Biologiche, Chimiche e Farmaceutiche		
ACADEMIC YEAR	2020/2021		
MASTER'S DEGREE (MSC)	HUMAN FEEDING AND NUTRITION SCIENCES		
INTEGRATED COURSE	NUTRITION BIOCHEMISTRI AND NUTRIGENOMICS		
CODE	21002		
MODULES	Yes		
NUMBER OF MODULES	2		
SCIENTIFIC SECTOR(S)	BIO/10, BIO/18		
HEAD PROFESSOR(S)	SCHIERA GABRIELLA	Professore Associato	Univ. di PALERMO
OTHER PROFESSOR(S)	SCHIERA GABRIELLA CARADONNA FABIO	Professore Associato Professore Associato	Univ. di PALERMO Univ. di PALERMO
CREDITS	9		
PROPAEDEUTICAL SUBJECTS			
MUTUALIZATION			
YEAR	1		
TERM (SEMESTER)	1° semester		
ATTENDANCE	Not mandatory		
EVALUATION	Out of 30		
TEACHER OFFICE HOURS	**CARADONNA FABIO** Monday 11:00 12:00 Studio PP 26b, Dip. STEBICEF, viale delle Scienze, Ed. 16, piano -1. Si fa presente che tramite email e' possibile chiedere ricevimento per qualunque altro giorno o orario.E' anche possibile richiedere ricevimento a distanza su Microsoft TEAMS. Tuesday 15:00 16:00 Si fa presente che, in particolare, per gli studenti del CdS in Biotecnologie e Innovazione Tecnologica, presso le strutture del polo didattico di Trapani (o della struttura "Principe di Napoli"), i ricevimenti, su richiesta, possono essere svolti anche su piattaforma teams o in giorni/orari diversi da concordare via mail con il docente. **SCHIERA GABRIELLA** Thursday 10:00 12:00 Dipartimento STEBICEF, viale delle Scienze edificio 16; previo contatto via mail: gabriella.schiera@unipa.it		

DOCENTE: Prof.ssa GABRIELLA SCHIERA

PREREQUISITES	Basic knowledge in General and Organic Chemistry, Biochemistry, Human Physiology and Genetics.
LEARNING OUTCOMES	Knowledge and understanding: To have acquired the specific terminology of the basic disciplines: Genetics and Biochemistry. To know biological molecules contained in food and to understand the main metabolic processes in which they are involved; know the main nutrigenomic effects of molecules contained in human's food and drink and the epigenetic principles of food-DNA interaction. Applying knowledge and understanding: Knowledge of the biochemical role of nutrients, their presence in specific foods and their energetic role; knowing how to apply the knowledge acquired to identify foods with a nutrigenomic effect and knowing how to distinguish them from others with a metabolic effect only. Making judgements: Capacity of evaluating and integrating autonomously the information obtained from the literature. Communication: Ability to explain, in a simple and clear way, the main biochemical processes and the nutrigenomic properties that underlie a healthy eating and food wellness managing; Lifelong learning skills: Students will develop learning skills that enable them, with the help of scientific literature in the biochemical-nutritional field, to go on with their studies with independence. They will also be able to learn the link between biochemical events, food-inducted, and intracellular nutrigenomic properties with effects on human health and well-being.
ASSESSMENT METHODS	Oral examination which consists of an interview aimed at verifying theoretic knowledge and full understanding of the topics addressed in the course of Nutritional Biochemistry and Nutrigenomics, as well as the candidate personal capacity of explain and processing his/her knowledge. In order to pass the exam, the candidate has to be evaluated with a mark between 18 and 30. In particular, the exam will be insufficient (F) if the student does not have an acceptable knowledge of the main contents of Nutritional Biochemistry and Nutrigenomics; the exam will be sufficient (E) if the student shows minimal knowledge of teaching contents, often limited to the main topic; modest ability to use the specific language of Nutritional Biochemistry and Nutrigenomics and to apply independently the knowledge acquired; the exam will be satisfactory (D) if the student shows good knowledge of the contents of Nutritional Biochemistry and Nutrigenomics, in some cases limited to the main topics; acceptable ability to use the specific language of the disciplines and to apply independently the knowledge gained; the exam will be good (C) if the student shows good knowledge of the contents of the Nutritional Biochemistry and Nutrigenomics and good properties of language; the student is able to apply knowledge to solve problems of medium complexity; the exam will be very good (B) if the student shows good knowledge of the contents of Nutritional Biochemistry and Nutrigenomics and excellent properties of language; the student demonstrates analytical-synthetic capacity and he/she is able to apply the knowledge to solve problems of average complexity and, in some cases, even high; the exam will be excellent (A – A+) if the student shows excellent knowledge of the contents of Nutritional Biochemistry and Nutrigenomics; the student demonstrates high analytic-synthetic capacity and he/she is able to apply the knowledge to solve problems of high complexity.
TEACHING METHODS	Frontal lectures.

MODULE
NUTRIGENOMICS

Prof. FABIO CARADONNA

SUGGESTED BIBLIOGRAPHY	
1- “Nutrigenomica ed epigenetica. Dalla biologia alla clinica” (Italiano). Autori: Galimberti et al., 2017. Edizioni EDRA; 2- Articoli scientifici da repositories ufficiali specifici, discussi e consegnati agli studenti.	
AMBIT	20989-Attivit Formative Affini o Integrative
INDIVIDUAL STUDY (Hrs)	51
COURSE ACTIVITY (Hrs)	24
EDUCATIONAL OBJECTIVES OF THE MODULE	
The aim of the nutrigenomics module is to describe, among the various biochemical pathways related to human nutrition, those which, in particular, by their ability in epigenetic modulations, target DNA and its expression. In addition, the module aims to educate students on the compensating epigenetic effects that some molecules contained in foods can exert as a contrast to environmental pollutants to which the humans are exposed, either naturally or by an anthropic hand.	

SYLLABUS

Hrs	Frontal teaching
1	Environment and diet
6	Nutrition and epigenetics
6	Nutrition, DNA damage, cancer, ageing and other diseases
2	Gene-gene, genes-environment, genes-microbiota, interactions
1	Quantitative Trait Loci (QTL) and methylation Quantitative Trait Loci (meQTL) in men
4	Nutrigenomics of Mediterranean diet
2	Mutagen-induced DNA damage modulating power exerted by diet-contained molecules
2	Elements of nutrigenetics: the taste genetics and the consequent stable food choices

MODULE
BIOCHEMISTRY OF NUTRITION

Prof.ssa GABRIELLA SCHIERA

SUGGESTED BIBLIOGRAPHY

Arienti Giuseppe - Basi molecolari della nutrizione - Piccin
Leuzzi; Bellocco; Barreca; Biochimica della nutrizione- Zanichelli
Campbell Farrell; Biochimica-Edises

AMBIT	50514-Discipline Biomediche
INDIVIDUAL STUDY (Hrs)	102
COURSE ACTIVITY (Hrs)	48

EDUCATIONAL OBJECTIVES OF THE MODULE

The main aim of Nutritional Biochemistry is to provide the students with the basics for understanding:
-the biochemical and nutritional role of the molecules contained in foods commonly used in human nutrition,
- the way in which they are digested, absorbed and processed from the metabolic point of view,
- the hormonal regulation of these processes and the metabolic interrelationships between the various organs.

SYLLABUS

Hrs	Frontal teaching
2	Introduction. Foods and nutrients. Daily energy requirement. Basal metabolism. Energy metabolism: Main mechanisms of metabolic control (enzymes, effects of substrate concentration, pH and temperature, enzymatic inhibition, allosteric modifications, covalent modifications, gene regulation, compartmentalization), metabolomics and applications.
2	Vitamins: nutritional significance and relationships with the metabolism. Fat soluble vitamins A, D, E, K, their biochemical action and deficiency, recommended needs, food sources and toxicity. Water-soluble vitamins: B group, anti-anemic vitamins, ascorbic acid, biochemical action and deficiency, recommended needs, food sources.
8	The energy metabolism of macronutrients in nutritional terms: Digestion and absorption of carbohydrates. Glycemic index. Glycemic load. Glycemic control. Metabolic pathways involved in glucose metabolism (glycolysis, glycogenosynthesis, gluconeogenesis), metabolism of the main sugars in the diet. Dietary fibers: Definition of fiber. Dietary fiber sources. Soluble and insoluble fibers. Physiological and beneficial effects.
8	Digestion and absorption of lipids. Structure of the main lipids and their functions. Metabolic use of fatty acids: beta oxidation, lipogenesis, metabolism of ketone bodies and hormonal control. Eicosanoids, glycerophospholipids and sphingolipids: structure, function and biosynthetic pathways. Food Cholesterol and endogenous cholesterol: cholesterol balance in the body. Covalent and transcriptional regulation of cholesterol biosynthesis (by SREBP-SCAP). Transport of cholesterol and other lipids by plasma lipoproteins. Control of blood cholesterol. Main food phytosterols: structures and role in the reduction of blood cholesterol.
8	Protein digestion and amino acid absorption. Amino acid metabolism: transamination, oxidative deamination, decarboxylation, urea cycle. Protein requirement and nitrogen balance. Nutritional value of proteins. Use of amino acids for the synthesis of non-protein nitrogen compounds. Pathologies associated with impaired digestion and absorption of nutrients (e.g. lactose intolerance, celiac disease), Malnutrition: Kwashiorkor and Marasmus. Pathologies related to an altered metabolism of amino acids: phenylketonuria.
2	Ethanol. Alcoholic and nervine drinks. Absorption and distribution of ethanol. Ethanol metabolism: alcohol dehydrogenase, aldehyde dehydrogenase, microsomal system. Metabolic alterations induced by ethanol on carbohydrate and lipid metabolism.
2	Role of antioxidants in nutrition: free radicals; oxidative stress; free radical toxicity (effects on proteins, lipids, nucleic acids); defense mechanisms: enzymatic (superoxide dismutase, glutathione peroxidase, glutathione reductase, catalase, glucose-6-phosphate dehydrogenase) and non-enzymatic compounds (vitamin C, vitamin E, carotenoids, bioflavonoids, glutathione, ceruloplasmin, selenium).
4	Inorganic elements: mineral salts, regulation of homeostasis and biochemical role. In particular, iron metabolism: absorption, homeostasis and regulation. IRE sequences and iron-dependent post-transcriptional regulation of the synthesis of proteins involved in iron metabolism. Calcium metabolism and its regulation.
2	Xenobiotics and their metabolism.
2	New foods: Microbiota (function of the microbiota, variation in the course of life, influence of the diet). Functional foods. Probiotics. Prebiotics. Fortified foods. Supplemented foods. "Light" foods.
8	Metabolic changes in the fasting-feeding cycle with particular attention to the metabolic pathways in the liver, muscle tissue, adipose tissue, red blood cell and brain. Hormones that regulate energy metabolism; obesity and metabolic syndrome.