



**Code: BIO/13**

**Credits: 9**

**Course: Elements of biochemistry and human nutrition**

**Main language of instruction: Italian**

**Other language of instruction: English**

## **Teaching Staff**

### **Head instructor**

**Prof. Federica Nigro - [Federica.nigro@unicusano.it](mailto:Federica.nigro@unicusano.it)**

## **Introduction**

The course aims to give the student the basic elements of biochemistry in relation to nutritional aspects.

During the course the metabolism of each class of nutrients will be covered;. The foundations of human nutrition will be laid, also dealing with specific aspects such as the Mediterranean Diet and functional foods, a rapidly developing trend.

## **Educational Objectives**

The Elements of Biochemistry and Human Nutrition course has the following educational objectives:

1. Review of the biochemistry base related to each class of nutrients
2. Illustrate the mechanisms of digestion and absorption of food
3. Principles of Human Nutrition
4. Functional Foods
5. Mediterranean Diet

## **Competencies:**

### **A. Knowledge and understanding:**

At the end of the course the student will have knowledge about carbohydrates, proteins, vitamins, lipids biochemistry and will have acquired the ability to analyze them. Furthermore, the student will acquire knowledge of the functioning of the main organs involved in metabolism and how the

digestive process of nutrients occurs. The student will acquire knowledge relating to the basics of human nutrition by understanding what the peculiar aspects of a healthy diet are, which can be exploited for technological applications; the student will acquire knowledge relating to functional foods and nutraceuticals.

**B. Applying knowledge and understanding:**

The student will be able to use knowledge of nutritional biochemistry to seek solutions to food production problems.

**C. Learning skills:**

At the end of the course the student will have knowledge of the fundamental notions necessary for nutrient analysis. All this will allow him to continue his engineering studies with greater competence and will provide him with the basis to be able to continue a path aimed at food industry topics.

## Syllabus

*1. Programme of the course:*

### **Subject 1 – Classification of Biological Structures and Introduction to Metabolism**

(3 video-recorded theory lessons for a duration of 15 hours - week 1) the following topics are addressed: Basic chemistry, macromolecules, introduction to energy metabolism, enzymes.

### **Subject 2 – Digestion and Absorption**

(4 video-recorded theory lessons for a duration of 20 hours - week 2) where the following topics are addressed: Anatomy and physiology of the digestive tract (digestion and absorption of carbohydrates, proteins, lipids; absorption of water and minerals), microbiota human and nutrients resistant to digestion.

### **Subject 3 - Carbohydrate metabolism**

(2 video-recorded theory lessons for a duration of 10 hours - week 3) where the following topics are addressed: glycolysis and gluconeogenesis; glycogenolysis and glycogenosynthesis

### **Subject 4 – Lipid Metabolism**

(2 video-recorded theory lessons for a duration of 10 hours - week 4) Topics covered: fate of dietary lipids; oxidation of fatty acids (Beta-oxidation); lipoproteins; biosynthesis of lipids (fatty acids and cholesterol).

### **Subject 5 – Protein metabolism**

(1 video-recorded theory lesson for a duration of 10 hours - week 5) Topics covered: oxidation of amino acids; Urea cycle; biosynthesis of amino acids; nitrogen monoxide.

### **Subject 6 – Common pathways of energy metabolism**

(3 video-recorded theory lessons for a 15-hour commitment - week 6) Topics covered: Krebs cycle; oxidative phosphorylation; ethyl alcohol metabolism.

### **Subject 7 – Regulation of metabolism**

(2 video-recorded theory lessons for a duration of 20 hours – week 7) Topics covered: tissue-specific metabolisms; hormonal regulation; metabolic diseases: diabetes mellitus

### **Subject 8 – Human Nutrition**

(8 video-recorded theory lessons for a duration of 35 hours in weeks 8 and 9) Topics covered: nutritional principles (carbohydrates, proteins, lipids, minerals and vitamins); water (body water, cellular osmosis and water balance) and drinks; antioxidant substances; anti-nutrients; functional foods; Mediterranean diet

### **Evaluation system and criteria**

The exam consists in a written test that includes multiple choice questions and open questions on different parts of the course.

In addition, 3 Etivities are optional; these will allow you to have from 0 to 5 points which will be added to the grade achieved during the exam.

Etivity consists of a reading and understanding of a scientific article that deals with issues related to the food industry (Text comprehension; drafting a ppt; report to delve deeper into the topic).

### **Bibliography and resources**

The teaching material on the platform is divided into 8 modules. They cover the entire program and each of them contains handouts, slides and video lessons in which the teacher comments on the slides. This material contains all the elements necessary to study the subject.

Recommended texts:

-Lehninger. Principles of Biochemistry. 4th edition. Nelson, Cox.

- Functional Foods and Nutraceuticals - Bioactive Components, Formulations and Innovations (Editors: Chukwuebuka Egbuna, Genevieve Dable Tupas)



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- Present Knowledge in Nutrition- Basic Nutrition and Metabolism (11th Edition - July 20, 2020. Editors: Bernadette P. Marriott, Diane F. Birt, Virginia A. Stalling, Allison A. Yates)