

**Human Physiology**

Code: 103252  
ECTS Credits: 6

| Degree                              | Type | Year | Semester |
|-------------------------------------|------|------|----------|
| 2501925 Food Science and Technology | FB   | 2    | 1        |

**Contact**

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**Use of Languages**

Principal working language: catalan (cat)  
Some groups entirely in English: No  
Some groups entirely in Catalan: No  
Some groups entirely in Spanish: No

**Teachers**

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**Prerequisites**

It is essential to have acquired the knowledge of Cell Biology, Animal Biology and Biochemistry that is explained in the first year of the degree.

It is important to take the Biochemistry II course simultaneously since its contents are complementary to those of the Human Physiology subject

**Objectives and Contextualisation**

The knowledge that the student must have acquired once the subject is overcome is structured in the following major blocks:

- 1- Physiological principles and physiology of excitable tissues.
- 2- Endocrine regulation of the organism.
- 3- Functions of the gastrointestinal system.
- 4- Reproductive function.
- 5- Cardiovascular and respiratory functions
- 6- Renal physiology.

The knowledge taught in this subject should be the basis for understanding concepts that will be explained later, such as those related to Toxicology, Nutrition, Composition and properties of food, food production, etc.

## Competences

- Analyse, summarise, resolve problems and make professional decisions.
- Apply knowledge of the basic sciences to food science and technology.
- Apply the scientific method to resolving problems.
- Communicate effectively with both professional and non-professional audiences, orally and in writing, in the first language and/or in English.
- Develop individual learning strategies and planning and organisation skills.
- Display knowledge of nutrients, of their bioavailability and function in the organism, and the bases of nutritional balance.
- Display knowledge of nutritional needs and the fundamental principles governing relationships between food and health.
- Search for, manage and interpret information from different sources.
- Use IT resources for communication, the search for information within the field of study, data processing and calculations.

## Learning Outcomes

1. Analyse, summarise, resolve problems and make professional decisions.
2. Apply the scientific method to resolving problems.
3. Communicate effectively with both professional and non-professional audiences, orally and in writing, in the first language and/or in English.
4. Describe the physiological mechanisms of the individual.
5. Determine the relationship between the organoleptic properties of foods and the corresponding sensory mechanisms of the organism.
6. Develop individual learning strategies and planning and organisation skills.
7. Discern nutritional needs during breast feeding and growth.
8. Discuss the impact of certain nutritional deficiencies on the functioning of the organism.
9. Establish the mechanisms by which nutrients are absorbed and then distributed around the organism.
10. Establish the mechanisms for transporting nutrients to the organism.
11. Explain the involvement of the endocrine system in the maintenance of a suitable nutritional state in the organism,
12. Explain the need for special diets in certain human pathologies.
13. Identify the absorption areas of the gastrointestinal tract in terms of the type of compound.
14. Identify the disintoxication mechanisms of the organism.
15. Identify the nutritional requirements for the correct functioning of the different systems of the organism.
16. Illustrate the mechanisms of food digestion that give rise to absorbable compounds.
17. Relate the different organs and systems to their hierarchical organisation.
18. Search for, manage and interpret information from different sources.
19. Use IT resources for communication, the search for information within the field of study, data processing and calculations.

## Content

### THEORY CLASSES (38h)

#### Physiological principles

1- Presentation. Homeostasis Extracellular, intracellular fluid. Negative and positive feedback Nervous and endocrine control. Reflex. Neuroendocrine control. Hormone, neurotransmitter and neurohormone concept. Body Volumes.

2- Intercellular communication. Types of receptors: membrane receptors and intracellular receptors. G coupled protein receptors (GPCR). Concept of second messenger. Characteristics of the receptor-messenger union.

#### Nervous System

3- Structure of the nervous system. Types of neurons. Central and peripheral nervous system. Somatic and autonomic nervous system. Enteric nervous system.

4- Membrane potential and action potential. Membrane potential: ionic base. Nernst's potential. Goldman equation. Phases of the action potential. Ionic base. Absolute and relative refractory period. Law of all or nothing. Rebase and Chronoxy. COMPUTER PRACTICE (2h)

5- Synapses (1). Action potential propagation. Pre and postsynaptic mechanisms of neurotransmission. Neural networks.

6- Synapses (2) Neurochemistry and receptors. Synthesis and degradation of neurotransmitters. Transduction mechanisms. Receptors: types and mechanisms of action Examples: Acetylcholine, catecholamines, amino acids, polypeptides, gaseous neurotransmitters and purines.

7- Skeletal, cardiac and smooth muscle. Mechanical and electrical mechanisms that cause muscle contraction.

8- Concept of Receptor. Types of receptors Genesis of the potential receptor and of the action potential in the afferent pathway. Tonic and phasic receptors, intensity of the stimulus. Type of afferent neurons. Nervous pathways Proprioception Cortical representation Examples of different receptors.

9- Taste and smell. Smell: Receptors involved. Transduction mechanism. Afferent pathways Anosmia and macroosmia. Pheromone detection. Taste: taste buds. Type of flavors Mechanisms of transduction. Nervous pathways PRACTICE SENSES (2h)

10- Control of visceral function. Autonomic nervous system. Neurotransmitters and receptors involved. Functions of the autonomic nervous system. Afferent pathways. Enteric nervous system.

Endocrine regulation of the organism.

11- Concept of hormone and target tissue. Hormone receptors Type of hormones and hormonal secretions. Factors that modify the response to hormones.

12- General organization of the endocrine system. Hypophysis. Hypothalamic control of the adenohipophysis. Relationship of the hypothalamus with other superior structures. Hormones of the neurohypophysis. Hypothalamus-pituitary tract.

13- Thyroid hormones. Secretion and transport of thyroid hormones. Effects. Regulation of thyroid secretion.

14- Endocrine functions of the pancreas. Insulin and glucagon: secretion and effects. Somatostatin. Regulation of pancreatic secretions.

15- Growth hormone. Direct and indirect effects. Somatomedin. Regulation of growth hormone secretion.

16- The adrenal gland. Functions of the medullary hormones: adrenaline and noradrenaline. Cortical hormones: glucocorticoids and mineralocorticoids.

17- Hormones regulating the metabolism of calcium and phosphorus. Physiology of the bone. Parathyroid hormone, vitamin D and calcitonin. Actions and control of its secretion.

18- Energy metabolism and thermoregulation. Energy balance. Leptin Actions on metabolism and intake.

19- Immune response of the organism. Cells and organs of the immune system. Innate immunity, presentation of antigens and acquired immunity. Cellular and humoral response. Immune memory. Active and passive immunity.

Cardiovascular, respiratory and renal physiology.

20- Structure of the cardiovascular system. Cardiac cycle. Electrical and mechanical activities of the heart.

21- Characteristics of arteries and veins. Arterial and arteriolar circulation. Capillary circulation. Venous circulation. Lymphatic circulation

22- Local control of tissue blood flow. Regulation of mean arterial blood pressure. Relative power of the different control mechanisms.

23- Mechanics of respiration. Physical bases of gas exchange. Blood transport of oxygen and carbon dioxide.

24- Regulation of breathing. Nervous and chemical control. Participation in the regulation of the acid-base balance.

25- The kidney. Renal circulation. Glomerular function

26- Tubular functions. Tubular reabsorption and secretion. Mechanisms of concentration and dilution of urine. Urination. Renal role in the regulation of the acid-base balance.

Physiology of the digestive system.

27- Gastrointestinal functions. Control of gastrointestinal functions. Enteric nervous system. Hormones and gastrointestinal peptides.

28- Gastrointestinal secretions: salivary, gastric, pancreatic and biliary secretion.

29- Swallowing. Gastric filling and emptying.

30- Postprandial intestinal motility: segmental and peristaltic movements. Migrating motor complexes.

31- Digestion and intestinal absorption. Secretion and absorption of water and electrolytes in the intestine.

32- Liver and gallbladder. Liver functions and enterohepatic circulation. Functions of the gallbladder and regulation of biliary secretion.

33- Immunology and intestinal ecology. Intestinal flora Oral tolerance Probiotics and prebiotics

DIGESTIVE PRACTICE (4h)

Reproduction

34- Biology of sex. Sex steroids Testicular function

35- Ovarian function and ovarian cycle. Follicular development and ovulation. Regulation of the ovarian cycle.

36- Gestation. Recognition and endocrine support of pregnancy. Birth.

37- Physiology of lactation. Mechanism of milk secretion. Ejection of milk.

PRACTICE PROGRAM (8h)

1- Action potential(2h)

2- Special senses practice (2h)

3- Integrated digestive practice (4h)

SEMINARS (6h)

Four seminars, of 1,5 h each, dedicated to the exposition and resolution of the following cases /problems:

1- Seminar 1: Nervous system

2- Seminar 2: Endocrine system

3- Seminar 3: Digestive system

4- Seminar 4: Cardio-respiratory and renal functions

## Methodology

The teaching methodology will involve theory classes that we will try to be as participatory as possible. We will also do practical classes in the computer classroom in order to complete and deepen the concepts covered in the theory sessions. Students must work in group 4 cases that will be delivered, corrected and scored. The resolution of each one of the cases will be done in a 1.5 hour seminar.

## Activities

| Title                            | Hours | ECTS | Learning Outcomes                                           |
|----------------------------------|-------|------|-------------------------------------------------------------|
| Type: Directed                   |       |      |                                                             |
| Master classes                   | 38    | 1.52 | 4, 5, 8, 7, 10, 9, 11, 12, 14, 15, 13, 16, 17               |
| Practice                         | 8     | 0.32 | 1, 2, 4, 5, 7, 10, 9, 11, 14, 15, 13, 16, 17                |
| Seminars                         | 6     | 0.24 | 18, 3, 4, 5, 8, 7, 9, 11, 12, 14, 15, 17, 19                |
| Type: Supervised                 |       |      |                                                             |
| Resolution of cases and problems | 23    | 0.92 | 1, 2, 18, 4, 5, 8, 7, 10, 9, 11, 12, 14, 15, 13, 16, 17, 19 |
| Type: Autonomous                 |       |      |                                                             |
| Study                            | 72    | 2.88 | 4, 6, 5, 8, 7, 10, 9, 11, 12, 14, 15, 13, 16, 17            |

## Assessment

### EVALUATION.

The final grade is calculated based on two exams (80% of the grade) and the grade of cases and papers (20% of the grade).

### BLOCK 1

#### Exam 1

40% first exam. Content evaluated:

- Physiological principles and physiology of excitable tissues.
- Endocrine regulation of the organism

It includes theory + practices + cases and exercises worked in the seminars.

The block is approved when the exam grade is  $\geq 5$

### BLOCK 2

#### Exam 2

40% second exam. Content evaluated:

- Physiology of the digestive system.
- Cardiovascular, respiratory and renal physiology.
- Reproductive function

It includes theory + practices + cases and exercises worked in the seminars.

The block is approved when the Examination Note is  $\geq 5$

Recovery

The recovery is done in blocks, and the student only has to take the examination of the block that has not been approved. The exam note must be  $\geq 5$ .

Final qualification to pass the subject:

40% exam 1+ 40% exam 2+ 20% average grade of cases and exercises worked  $\geq 5$

A student will be considered presented if he attends an exam. The cases will be reviewed in tutorials and the exams will be reviewed in specific sessions.

Second or third year students:

They can avail of one of the following options:

1. Continuing education: attendance to practices and delivery of works. In this case the evaluation follows the procedure described above.
2. Unique evaluation for exams. In this case the minimum grade is 5 in each exam and the final grade is 50% of each exam.

Note: the contents of the exam are theory, practices and seminars.

A student will not be evaluable if he has participated in evaluation activities that are less than 15% of the total.

## Assessment Activities

| Title                                      | Weighting | Hours | ECTS | Learning Outcomes                                              |
|--------------------------------------------|-----------|-------|------|----------------------------------------------------------------|
| Evaluation of cases and practical problems | 20%       | 0     | 0    | 1, 2, 18, 3, 4, 5, 8, 7, 10, 9, 11, 12, 14, 15, 13, 16, 17, 19 |
| Exam                                       | 80%       | 3     | 0.12 | 4, 6, 5, 8, 7, 10, 9, 11, 12, 14, 15, 13, 16, 17               |

## Bibliography

Ganong. Fisiologia Medica (Ed: manual Moderno)

Guyton. Tratado de Fisiologia Medica. (Ed: Elsevier).

Vander, Sherman, Luciano's Human Physiology: The Mechanisms of Body Function, 9/e (Ed: Mc Graw Hill)

Fisiologia Humana. J.F. Tresguerres.