Universidad Zaragoza

**Academic Year/course: 2022/23**

# 30806 - General and nutritional physiology

## Syllabus Information

**Academic Year:** 2022/23
**Subject:** 30806 - General and nutritional physiology
**Faculty / School:** 105 - Facultad de Veterinaria
**Degree:** 568 - Degree in Food Science and Technology
**ECTS:** 6.0
**Year:** 1
**Semester:** Second semester
**Subject Type:** Basic Education
**Module:**

# 1. General information

## 1.1. Aims of the course

**The subject and its expected outcomes respond to the following approaches and objectives:**

The subject "General and nutritional physiology" is part of the Basic Training subjects and provides students with important physiological knowledge. General and nutritional physiology together with other subjects, such as General Chemistry, General Physics and Fundamentals of Physical Analysis and Biochemistry, provide basic knowledge and skills for other subjects of the Graduate Degree in Food Science and Technology.

The aim of the subject is the acquisition of an integrated knowledge of physiology, especially in the aspects of digestive function and nutrition.

These approaches and objectives are aligned with the following Sustainable Development Goals (SDGs) of 2030 Agenda of the United Nations (https://www.un.org/sustainabledevelopment/), so that the acquisition of the learning outcomes of the subject provides training and competence to contribute to some extent to the achievement of Goal 2: Zero hunger; Goal 3: Health and well-being; Goal 4: Quality education; Goal 12: Responsible consumption and production; Goal 16: Peace, justice and strong institutions; and Goal 17: Partnerships for achieving goals.

## 1.2. Context and importance of this course in the degree

In the subject of " General and nutritional physiology" provide basic knowledge, which is why it is taken in the second semester of the first year. Students acquire knowledge and skills that will have great applicability for Nutrition and Health subjects, such as Nutrition and Dietetics.

## 1.3. Recommendations to take this course

Although this is a basic training subject, it is advisable to have studied subjects such as Chemistry, Physics, Biology and English in the courses prior to entering the University.

# 2. Learning goals

# 3. Assessment (1st and 2nd call)

# 4. Methodology, learning tasks, syllabus and resources

## 4.1. Methodological overview

**The learning process designed for this subject is based on the following:**

- **Theoretical classes:** Lectures (40 h), with the theoretical contents enumerated below, will be given in the classroom in 40 sessions of 50 min.
- **Practical classes:** They will be given in the Laboratory of Physiology or in the Computer classroom, in 8 sessions of 2 h (total: 16 h). Initially, the teacher will make a short explanation to the students. Then, the students will perform the practice. The obtained results will be analyzed and reasoned at the end of the practical session.
- **Tutored projects:** Each student will prepare and submit a supervised work that will be shown in the classroom (its implementation will involve 25 h of student work). It will be performed in groups of 4-5 students. First, the teacher will make a presentation and orientation of the work to each student group. The professor will supervise, guide and resolve any questions about the material used to prepare the work presentation. Finally, the student groups will carry out the oral presentation of their work. They will attend the presentation of all other students that will take place in four seminars (4 h)
- Teaching materials for the course (class presentations, laboratory protocols, recommended bibliography, web addresses) will be available in advance on the Digital Teaching Ring (ADD) of the University of Zaragoza and on the reprographic service of the Faculty of Veterinary Medicine of Zaragoza. This will allow the student to review the corresponding documents before a certain lecture or practical session, in order to encourage their participation in the development of a true participatory class or practice.

Students must follow the regulations described in:

- Prevention: A guide for students at the University of Zaragoza: https://uprl.unizar.es/sites/uprl.unizar.es/files/archivos/Procedimientos/guia_preventiva_para_estudiantes.pdf
- Manual de seguridad en los laboratorios de la Universidad de Zaragoza y normas marcadas por la Unidad de Prevención de Riesgos Laborales: https://uprl.unizar.es/inicio/manual-de-procedimientos https://uprl.unizar.es/sites/uprl.unizar.es/files/archivos/Procedimientos/manual_de_seguridad_en_los_laboratorios_de

In addition, students will follow as well any instructions related to biosecurity given by the professor

## 4.2. Learning tasks

**The course includes the following learning tasks:**

The course is structured into 40 participatory lectures (40 h), 16 hours of laboratory or computer practices, and 4 hours of seminars. In addition, the student has to perform a work and present an oral report on a particular physiological process, or pathological or nutritional aspects related to this process. The seminars (4 h) correspond with the presentations performed by the students of these works.

The 40 lectures are divided into 7 thematic blocks. The eight practice sessions will be adjusted over time, where possible, to the concepts explained in the lectures. The tutored projects will also serve to reinforce and discuss part of physiological concepts explained throughout the course.

## 4.3. Syllabus

**The course will address the following topics:**

**A) Lectures**. Lectures are organized in 7 thematic blocks:

**I. Introduction and physiology of the nervous system (7 h).**

- 1. Concept of Physiology: Objectives and interest. Relationship with other sciences. Physiology in the Degree of Science and Food Technology.
- 2. Homeostasis. Transport through the cell membrane. Resting membrane potential.
- 3. Neuronal physiology: Action potential. Synapse.
- 4. Skeletal muscle physiology. Excitation-contraction coupling.
- 5. Introduction to the physiology of the nervous system. Sensory receptors.
- 6. Motor activity. Spinal cord.
- 7. Autonomic nervous system. Sympathetic and parasympathetic system.

**II. Blood and cardiovascular physiology (6 h).**

- 8. General properties and functions of blood. Erythrocyte physiology.
- 9. Physiology of leukocytes and platelets. Hemostasis.
- 10. Heart physiology. Cardiac electrophysiology.
- 11. Mechanical activity of the heart. Cardiac cycle.
- 12. Physiology of blood vessels. Systemic, capillary and lymphatic circulation.
- 13. Regulation of cardiac activity and peripheral circulation. Arterial blood pressure.

**III. Respiratory and renal physiology (6 h).**

- 14. Breathing: pulmonary ventilation. Mechanics of breathing.
- 15. Gas exchange in the lungs and the tissues. Transport of respiratory gases.
- 16. Regulation of breathing. Nervous and chemical control.
- 17. Renal physiology. Glomerular filtration.
- 18. Tubular functions: reabsorption and secretion. Renal clearance. Urinary concentration and dilution.
- 19. Regulation of the volume and osmolarity of body fluids. Acid-base balance.

**IV. Physiology of the digestive system (9 h).**

- 20. Regulatory systems of gastrointestinal function.
- 21. Mastication. Salivary secretion. Swallowing.
- 22. Physiology of the stomach.
- 23. Physiology of the exocrine pancreas.
- 24. Liver and bile physiology.
- 25. Physiology of the small intestine.
- 26. Physiology of the large intestine.
- 27. Regulation of food intake: hunger-satiety.
- 28. Metabolism and energy balance.

**V. Physiology of the endocrine system (8 h).**

- 29. General characteristics of the endocrine system. Mechanisms of hormone action.
- 30. Hypothalamic and pituitary hormones.
- 31. Thyroid hormones.
- 32. Hormones involved in calcium and phosphate homeostasis.
- 33. Pancreatic hormones.
- 34. Adrenal gland. Steroid hormones and catecholamines. Stress.
- 35. Pineal gland. Melatonin. Biological rhythms.
- 36. Prostaglandins, thromboxanes and leukotrienes.

**VI. Physiology of reproduction and development (2 h).**

- 37. Physiology of pregnancy, childbirth and lactation.
- 38. Physiology of growth and development.

**VII. Integrated physiology (2 h).**

- 39. Integration and adaptation of the organism. Exercise physiology. Biological rhythms.
- 40. Control of body temperature. Acclimatization. Fever

**B) Practice program**

Each student will perform 8 sessions of 2 hours.

- **Practice 1.** The laboratory in Physiology Sciences. Good Laboratory Practices (GLP). Safety rules in the laboratory.
- **Practice 2.** Hematological analysis and assessment of blood results. Hematocrit value. Study of leukocytes. Blood smears.
- **Practice 3.** Electrocardiography.
- **Practice 4.** Pulse and arterial blood pressure. Spirometry.
- **Practice 5.** Urine analysis. Determination of proteins, urea, and creatinine.
- **Practice 6.** Study of intestinal absorption of nutrients. This practice will be given in English, and students will practice technical terminology in this language.
- **Practice 7.** Determination of salivary alpha-amylase. Oral glucose tolerance test.
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- **Practice 8.** Study of the physiological response to exercise.

**C) Tutored projects**

Each group of students will be assigned a topic related to different subjects of physiology. Students have to look for information on this topic, sort it, consult the doubts with the teacher and make a public presentation of their work.

**D) Seminars**

Four hours of seminars will be programmed in the classroom, and they will consist in the presentation and discussion of the tutored works carried out by the students.

## 4.4. Course planning and calendar

The planning of this subject and the corresponding theoretical classroom sessions calendar, laboratory practice and presentation of tutored works, as well as the corresponding evaluation tests is organized from the Dean of the Faculty of Veterinary Medicine and informed through the Faculty website ( https://veterinaria.unizar.es/academico/plan-estudios-grado-cta)