

Academic Year/course: 2021/22

## 26313 - Basic physiological principles for physical activity and sport

### Syllabus Information

**Academic Year:** 2021/22

**Subject:** 26313 - Basic physiological principles for physical activity and sport

**Faculty / School:** 229 - Facultad de Ciencias de la Salud y del Deporte

**Degree:** 295 - Degree in Physical Activity and Sports Science

**ECTS:** 12.0

**Year:** 2

**Semester:** Annual

**Subject Type:** Basic Education

**Module:**

## 1. General information

### 1.1. Aims of the course

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

#### 1) GENERAL

- To collaborate in the training of graduates in Physical Activity and Sports Sciences with extensive knowledge of the processes that govern the functioning of the body during exercise.

- To provide future graduates with the theoretical and practical knowledge of Effort Physiology necessary for the exercise of the profession.

#### 2) SPECIFIC

- To know how training (chronic exercise) influences muscle structure and function, cardiovascular and respiratory function, neuroendocrine response, and changes in acid-base balance.

- To understand the influence of environmental characteristics on the systemic response to effort.

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

Its contents provides sufficient knowledge to understand and describe the functions of systems and apparatus of the human body during exercise and facilitates the acquisition of the necessary knowledge and skills to perform certain functional examinations related to sports.

### 1.3. Recommendations to take this course

Due to the nature of the subject, it is recommended that the student have a minimum knowledge of anatomy and biology.

The contents of the subject are focused on the student knows the human physiological basis and subsequently to understand the mechanisms of "Adaptation to Exercise" based on the physiological functioning of the systems studied previously.

According to the recommendations of the health and academic authorities, if due to the pandemic caused by COVID 19, the recommended safety distance between participants in the designated spaces cannot be adopted, the theoretical and practical activities will be developed through Google Meet

## 2. Learning goals

### 2.1. Competences

**Upon passing the subject, the student will be more competent to ...**

Plan, develop and control the training process at its different levels and contexts, taking into account the individual

characteristics of the people.

Know and apply physiological principles to the different fields of physical activity and sport.

Furthermore, in this subject, as in the rest of the Graduate's subjects, all general competences (instrumental, personal and interpersonal and systemic relations) that appear in the Degree Report will be attended.

## 2.2. Learning goals

**The student, to pass this subject, must demonstrate the following results ...**

Integrate the physiological process, being able to recognize their causes, relationships and foundations.

Analyze the physiological process at molecular, cellular, apparatus and system levels, being also able to identify the different mechanisms of its regulation.

Explain the bases of modifications in the functioning of the human body during physical exercise.

Propose and / or choose the appropriate evaluation method depending on the type of effort studied, to subsequently understand and interpret the results of the physiological stress tests.

Apply the physiological principles of exercise, in the planning and execution of sports activities adjusted to individual reality and context.

Organize, plan and work as a team, based on the appropriate bibliographic bases.

## 2.3. Importance of learning goals

It is important that the student be able to acquire basic scientific training applied to physical activity and sport in its different manifestations. In the same way, the student should understand the scientific foundations of physiology and pathophysiology.

In turn, the student must apply theoretical knowledge to solve physiological problems that arise as problems or as practical demonstrations, and assimilate basic terminology that allows a better understanding of the specific content of other related subjects.

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

## 3.1. Assessment tasks (description of tasks, marking system and assessment criteria)

The student must show that he has achieved the learning results that are expected through the evaluation activities

GLOBAL TEST EVALUATION MODALITY

First partial (January):

Contents: First half of the theoretical and practical topics of the official program. Two kind of evaluation activities will be made (written test and ability of practice), which have to be passed separately to eliminate subject matter.

*Evaluation mode:*

1) Written test which contents two parts that will have to be passed separately (90%):

-Twenty five test questions with five possible answers, in which the effect of chance will be subtracted (50%)

- Four short answers (50%)

Between the questions, there will be included theoretical and practical questions learned in the classroom and in the laboratory.

In order to pass the exam and eliminate the subject, the student must obtain at least 45% of the maximum score in each of the two parts of the test.

The students who obtain the 45% of the maximum score may compensate with the qualification of the second part (only if the average of the two partial exams is more than 50% of the maximum score).

2) Evaluation of the skill of the practice(10%)

The performance of the practical part will be evaluated by an evaluation rubric, which evaluates different parameters related to attitude, performance and other aspects of the practical activities in the laboratory. Students who do not attend more than 20% of laboratory activities, must take a practical exam.

*Second part and final exam (June):*

- *Evaluation of first part: the same structure as the first partial exam- Evaluation of the second part:*

Option 1: This option will be only available for those students that assisst at least to 80% practical seasons of the second part of the subject and had responded at least 80% of the tracking test.

1.- Written exam (75%): test and graph interpretation.

3.- Follow-up of the subject (25%): at the end of each theme an evaluation test will be done in the classroom. The note in this section will be the arithmetic average of all the tests performed by the student.

Option 2: any student may be presented

1.- Written test (100%): it will be composed of questions type test and performance / interpretation of graphs. The official day of the examination calendar proposed by the center will take place.

To pass the subject, the arithmetic mean of the two parts must exceed 5 out of 10. You can compensate one part with another provided you get at least 4 points out of 10 possible in each of them. *Final exam (September):* In case of not passing the subject in June, the student will have to examine the whole subject in this call.

- *Evaluation of first part*: the same structure as the first partial exam
- *Evaluation second part*:
  - 1.- Written exam (100%): It will be composed of questions type test and performance / interpretation of graphs.

## 4. Methodology, learning tasks, syllabus and resources

### 4.1. Methodological overview

The methodology followed in this course is oriented towards achievement of the learning objectives. The first part of the course focuses on understanding the main concepts of General Physiology. The second part helps the student to understand Exercise Physiology. A wide range of teaching and learning tasks are implemented, such as lectures, practice sessions, laboratory practice sessions, and tutorials.

### 4.2. Learning tasks

The course includes 6 ECTS organized according to:

- Lectures (3 ECTS): 75 hours.
- Practice sessions (1,4 ECTS): 35 hours.
- Practical seminars (0,4 ECTS): 10 hours.
- Assignments (0,4 ECTS): 10 hours.
- Autonomous work (6,64 ECTS): 166 hours.
- Evaluation (0.16 ECTS): 4 hours.

### 4.3. Syllabus

The course will address the following topics:

#### SECTION I. Physiology by systems

##### Lectures

1. GENERAL PHYSIOLOGY
  1. Concept of Physiology, internal environment and homeostasis
  2. Fundamentals of Cellular Physiology
  3. Transmembrane transport
  4. Potential for action
2. NERVOUS SYSTEM
  5. Functional organization of the nervous system
  6. Sensory functions of the nervous system
  7. Reflected action
  8. Higher regulation of motor activity
  9. Vegetative nervous system and thermoregulation
  10. Superior functions of the nervous system
3. LOCOMOTOR APPARATUS
  11. Functional structure of the muscle. Types of muscle fibers. Mechanism of muscle contraction
  12. Motor unit. Neuromuscular junction. Excitation-contraction coupling
  13. Biophysics of muscle contraction. Isotonic and isometric contraction
4. INTERNAL MEDIUM AND KIDNEY
  14. Biological liquids. Structure and general functions of the kidney
  15. Glomerular filtration. Resorption and tubular secretion
  16. Regulation of the isoosmia and isoionía. Urination
5. BLOOD AND IMMUNITY
  17. General functions of the blood. Plasma and formes elements
  18. Red blood cells. Metabolism of iron. Blood groups
  19. Platelets. Hemostasis
  20. Leukocytes. Immunity
6. CARDIOVASCULAR SYSTEM
  21. Characteristics and general functions of the cardiovascular system
  22. Electrical activity of the heart
  23. Mechanical activity of the heart. Cardiac cycle
  24. Regulation of cardiac function
  25. Arterial physiology. Microcirculation

- 26. Venous and lymphatic returns
- 27. Regulation of blood flow. Local circulation
- 7. RESPIRATORY FUNCTIONS
  - 28. Functions of the respiratory tract. Respiratory muscles
  - 29. Thoracic pressures. Respiratory mechanics Functions of the pleura and pleural fluid
  - 30. Respiratory cycle. Alveolar ventilation Respiratory membrane
  - 31. Transport of blood gases. Regulation of breathing
- 8. DIGESTIVE APPARATUS
  - 32. Functions of the mouth, esophagus and stomach
  - 33. Exocrine biliary and pancreatic secretions
  - 34. Intestinal physiology. Dregs
- 9. METABOLISM AND ENDOCRINE SYSTEM
  - 35. Metabolism of carbohydrates, proteins and lipids
  - 36. Energy metabolism
  - 37. Endocrine control system. Hormones. Hypothalamus-pituitary axes. Endocrine pancreas. adrenal glands

#### Practice sessions

- Practice 1: Exploration of the nervous system and senses
- Practice 2: Functional problem of the nervous system: motor activity
- Practice 3: Dynamometry. Electromyography
- Practice 4: Physico-chemical analysis of a urine sample. Urinary sediment
- Practice 5: Kidney functional problem: electrolyte imbalance
- Practice 6: Hematocrit and blood groups
- Practice 7: Blood functional problem: athlete's anemia
- Practice 8: Electrocardiogram at rest. Exploration of arterial pressure and pulse.
- Practice 9: Spirometry at rest
- Practice 10: Endocrine functional problem: glycemia

## SECTION II. Exercise physiology

### Lectures

1. Introduction to exercise physiology. Historical perspective and key concepts.
2. Energy system and exercise.
3. Muscular responses and adaptations to physical exercise.
4. Cardiovascular responses and adaptations to physical exercise.
5. Pulmonar responses and adaptations to physical exercise.
6. Aerobic exercise.
7. Anaerobic exercise.
8. Neuroendocrinic responses and adaptations to physical exercise.
9. Renal gastrointestinal function and physical exercise.
10. Age and gender related to physical exercise: children, elderly and women.
11. Thermal stress, altitude and physical exercise.

### Practice sessions

Practice sessions will be related to theory sessions (e.g.: maximal and submaximal exercise test, maximal oxygen consumption testing, aerobic and anaerobic threshold evaluation, maximal anaerobic power test, etc.).

## 4.4. Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course will be provided on the first day of class or please refer to the Faculty of Health and Sports Sciences website.

## 4.5. Bibliography and recommended resources

The updated bibliography of the subject is consulted through the library web page:

<http://psfunizar7.unizar.es/br13/ebuscar.php?tipo=a>