Course	**Master in Sports Science**			*Academic year*		**2021-2022**	
Subject	**Functional adaptation to training**			ECTS		5	
Type of course	**Compulsory**						
Year	**2º**	*Semester*	**1st semester**	*Student Workload:*			
Professor(s)	**Carolina Júlia Félix Vila-Chã**			*Total*	135	*Contact*	30
Area Coordinator	**Carolina Júlia Félix Vila-Chã**						

Planned SD

1. LEARNING OBJECTIVES

At the end of the UC student should be able to:

a) Accurately interpret the adaptation processes of the human body in response to different types of training/exercise, by explaining acute adaptations as well as chronic adaptations arising from systematic practice.

b) Understand and correctly describe the concepts of neuromuscular function, cardiorespiratory function and their relationship to motor performance in physical activities and sports.

c) Comprehend the biological basis for the sports training and to prescribe exercise by reading and control physiological variables.

d) Identify and apply physiological tests to properly assess neuromuscular function and cardiorespiratory function according to different variables that intends to measure.

2. PROGRAMME

A- Neuromuscular function

e. Properties of skeletal muscle: the force-length; force-time curve; force-velocity curve;
f. Mechanisms regulating the production of muscle strength
g. Neuromuscular and metabolic variables as foundations of the muscle force expressions
h. Acute Adaptations: - neuromuscular fatigue
i. Chronic adaptations in response to exercise: - changes in the CNS and skeletal muscle and their implication for motor performance

B- Cardiorespiratory function and energy metabolism

a. Mechanisms of regulation of cardiac and respiratory functions
b. Cardiorespiratory adaptations to exercise
c. Expressions of cardiorespiratory function
d. Physiological concepts associated to efforts with an energy consumption lower to VO2max: - Anaerobic threshold, aerobic-anaerobic efficiency and aerobic capacity.

e. Physiological concepts associated efforts with an energy consumption superior to VO2max: - power, capacity and anaerobic lactic and alactic efficiency.
f. Metabolic adaptations to exercise

C- Physiological tests and motor performance

a. Tests to measure different muscle strength expressions
   - Evaluation of the maximum strength and relative maximum strength – strength deficit determination;
   - Evaluation of the curve force-time;
   - Evaluation of the curve force –velocity
   - Evaluation of the muscle power
   - Evaluation of the reactive strength (power, elastic and reactive index)
b. Physiological tests to determine power and aerobic capacity
   - Evaluation of the VO2max (direct test);
   - Evaluation of the anaerobic threshold;
   - Indirect tests to measure VO2max
c. Physiological tests to determine power and anaerobic capacity
   - Wingate Test;
   - Bosco test;
   - Indirect tests to measure anaerobic capacity

3. COHERENCE BETWEEN PROGRAMME AND OBJECTIVES

This course, developed through the syllabus, targets a consolidated training essential to any professional in the sports field. Therefore, it is intended that the students acquire a physiological knowledge, enabling them to understand and optimize human movement, according to different physical activities and sports. Based on this assumption the selected contents are intended to achieve the defined objectives (Table 1).

Table 1 - Demonstration of the syllabus coherence with the curricular unit's objectives.

Syllabus content	⇨	Learning objectives
Module A e B	⇨	Items a), b) e c)
Module C		Item d)

4. MAIN BIBLIOGRAPHY

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Enoka RM, and Duchateau J. Muscle fatigue: what, why and how it influences muscle function. J Physiol. 2008;586(1):11-23.

Enoka, R. (2015): Neuromechanics of Human Movement. 5th edition. Human Kinetics.

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Fitts RH. Effects of regular exercise training on skeletal muscle contractile function. Am J Phys Med Rehabil 82: 320-331, 2003.

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Hughes S, Chapman DW, Haff GG, Nimphius S. The use of a functional test battery as a non-invasive method of fatigue assessment. PLoS One. 2019;14(2):e0212870. Published 2019 Feb 28. doi:10.1371/journal.pone.0212870

Lundberg TR, Fernandez-Gonzalo R, Gustafsson T, Tesch PA.Aerobic exercise does not compromise muscle hypertrophy response to short-term resistance training. J Appl Physiol. 2013 Jan;114(1):81-9.

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Mendonca GV, Vila-Chã C, Teodósio C, Goncalves AD, Freitas SR, Mil-Homens P, Pezarat-Correia P. Contralateral training effects of low-intensity blood-flow restricted and high-intensity unilateral resistance training. Eur J Appl Physiol. 2021 May 12. doi: 10.1007/s00421-021-04708-2. Epub ahead of print. PMID: 33982187.

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Schoenfeld, B (2020): Science and Development of Muscle Hypertrophy. 2nd edition. Human Kinetics

Taner, R e Gore, C. Physiological tests for elite Athletes. 2nd edition. Human Kinetics. 2013.

5. TEACHING METHODOLOGIES (INCLUDING EVALUATION)

Teaching methodologies

The unit is essentially composed by theoretical-practical classes, being primarily implemented through lecture method. In these sessions it will also be used observation models, short films illustrative of the systems studied as well as group interaction methods aiming to consolidate and systematize the addressed content and to discuss its applicability in different sports. In a more practical lesson it will be implemented laboratory activities to allow the application of physiological tests with respective collection and interpretation of data. We have also included moments of discussion scientific papers, with the content may be complementary to the program.

Evaluation rules

The evaluation is conducted in accordance with the "Regulation Scheme Frequency and Student Assessment." The normal mode of evaluation will be by frequency. The evaluation focuses on the frequency of student performance in the following components:

- One written test (50%) - The classification has as mandatory a minimum score of 9,5 points. If the minimum grade is not achieved there will be an exam whose final grade is 100%.
- One work of literature review and its presentation (50%).

6. COHERENCE BETWEEN TEACHING METHODOLOGIES AND OBJECTIVES

The methodologies chosen were selected in order to maximize the acquisition of the contents associated with each objective: (1) Exposure of content (orally and through digital means) and research work, analysis and interpretation of text/scientific articles - this methodology is used to display the content associated with all learning objectives; (2)application of knowledge in practical classes through the implementation of laboratory activities and preparation of reports - this methodology is used to consolidate the acquisition of content associated objectives defined in points c).

7. ATTENDANCE

It is according to the regime in place at ESECD.

ESECD, 28th of June of 2021