

# Postgraduate Diploma

## Muscular and Metabolic Physiology



## Postgraduate Diploma Muscular and Metabolic Physiology

- » Modality: online
- » Duration: 6 months
- » Certificate: TECH Global University
- » Credits: 18 ECTS
- » Schedule: at your own pace
- » Exams: online

Website: [www.techtute.com/us/physiotherapy/postgraduate-diploma/postgraduate-diploma-muscular-metabolic-physiology](http://www.techtute.com/us/physiotherapy/postgraduate-diploma/postgraduate-diploma-muscular-metabolic-physiology)

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# 01

# Introduction

Knowledge in Muscular and Metabolic Physiology is essential for Physiotherapy professionals, who require skills in this area to be able to carry out their work with maximum efficiency. That is the reason why more and more experts in this sector are in demand and why TECH has designed a program that seeks to meet this need, providing students with skills with which to face this work with the best quality. And this, with a study plan that delves into topics such as protein metabolism, athlete monitoring or nutritional planning. All this, in a convenient 100% online mode that allows students to combine their studies with their other obligations, without interfering with them.





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*Become an expert in Muscular  
and Metabolic Physiology in a few  
months and without leaving home"*

One of the most relevant and basic aspects of sports nutrition is muscle physiology and biochemistry, which is responsible for regulating the entire metabolic process resulting from physical exercise. That is why professionals with specific and advanced knowledge in this essential subject for Physiotherapy and Nutrition are increasingly in demand.

This is the reason why TECH has designed a Postgraduate Diploma in Muscular and Metabolic Physiology with which it seeks to provide students with innovative knowledge and practical skills with which to perform their work with the highest quality and knowing how to deal with any situation they encounter in the workplace. And this, through a syllabus that addresses topics such as nutrition for athletes, the biochemical assessment of the athlete or the mixed bioenergetics of muscle fibers.

All this, in a 100% online mode that allows students to study and combine this activity with their other obligations, without the need to be subject to strict schedules. In addition, with the total availability of a complete theoretical and practical content, updated and that represent a unique opportunity in the academic market.

The **Postgraduate Diploma in Muscular and Metabolic Physiology** contains the most complete and up-to-date Scientific program on the market. Its most outstanding features are:

- ♦ The development of case studies presented by experts in Muscle Physiology and Metabolism
- ♦ The graphic, schematic, and practical contents with which they are created, provide scientific and practical information on the disciplines that are essential for professional practice
- ♦ Practical exercises where self-assessment can be used to improve learning
- ♦ Its special emphasis on innovative methodologies
- ♦ Theoretical lessons, questions to the expert, debate forums on controversial topics, and individual reflection assignments
- ♦ Content that is accessible from any fixed or portable device with an Internet connection



*It delves into areas such as nutritional planning and energy requirements at different times of the season, without leaving home and at any time of the day"*

“

*Stand out in a booming sector that will significantly enhance your professional profile in the field of Sports Nutrition”*

The program includes in its teaching staff professionals from the sector who bring to this program the experience of their work, as well as recognized specialists from leading societies and prestigious universities.

The multimedia content, developed with the latest educational technology, will provide the professional with situated and contextual learning, i.e., a simulated environment that will provide immersive education programmed to learn in real situations.

This program is designed around Problem-Based Learning, whereby the professional must try to solve the different professional practice situations that arise during the academic year. For this purpose, the students will be assisted by an innovative interactive video system created by renowned and experienced experts.

*Acquire new knowledge on body composition for athletes, thanks to TECH.*

*Access all the content on muscle structure and muscle fiber types, from any device with Internet connection.*



# 02 Objectives

The objective of this program is to provide students with the necessary skills and knowledge to be able to face their future in the field of Sports Nutrition, with total guarantee of success. All this, through the most complete theoretical and practical contents of the academic market.







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*TECH's goal is you: give your career the boost it needs and specialize in Muscular and Metabolic Physiology”*



## General Objectives

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- ♦ Handle advanced knowledge on nutritional planning in professional and non-professional athletes for the healthy performance of physical exercise
- ♦ Manage advanced knowledge on nutritional planning in professional athletes of various fields in order to achieve maximum sports performance
- ♦ Learn advanced knowledge about nutritional planning in professional athletes from team sports to achieve the highest sports performance
- ♦ Manage and consolidate the initiative, entrepreneurial spirit to implement projects related to nutrition in physical activity and sport
- ♦ Know how to incorporate the different scientific advances into one's own professional field
- ♦ Acquire the skills to work in a multidisciplinary environment
- ♦ Gain an advanced understanding of the context in which the area of their specialty is developed
- ♦ Manage advanced skills in the detection of possible signs of nutritional changes associated with sports activities
- ♦ Manage the necessary skills through the teaching-learning process that will allow them to continue ways and learning in the field of sports nutrition, both through the contacts established with professors and professionals in the Postgraduate Diploma as well as on their own
- ♦ Specialize in the structure of muscle tissue and its role in sports
- ♦ Gain knowledge about the energetic and nutritional needs of athletes in different pathophysiological situations
- ♦ Specialize in the energetic and nutritional needs of athletes in the different situations specific to age and gender
- ♦ Become a specialist in the dietary strategies for the prevention and treatment of injured athletes
- ♦ Specialize in the energetic and nutritional needs of child athletes
- ♦ Specialize in the energetic and nutritional needs of Paralympic athletes



*You will achieve your goals thanks to the most advanced teaching tools and the most challenging practical exercises"*



## Specific Objectives

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### Module 1. Muscular and Metabolic Physiology Related to Exercise

- ♦ Gain an in-depth understanding of the structure of skeletal muscle
- ♦ Understand in depth the functioning of skeletal muscle
- ♦ Delve into the understanding of the most important changes that occur in athletes
- ♦ Delve into the mechanisms of energy production according to the type of exercise undertaken
- ♦ Further understanding of the interaction between the different energy systems that make up the muscle energy metabolism

### Module 2. Evaluation of the Athlete at Different Times of the Season

- ♦ Biochemical interpretation to detect nutritional deficits or over-training states
- ♦ Perform the interpretation of the different methods of body composition, to optimize the weight and fat percentage appropriate to the sport practiced
- ♦ Monitor the athlete throughout the season
- ♦ Plan the periods of the season according to their requirements

### Module 3. Parathletes

- ♦ Deepen understanding of the differences between the different categories of para-athletes and their physiological-metabolic limitations
- ♦ Determine the nutritional requirements of the different para-sportmen in order to establish a specific nutritional plan
- ♦ Further the knowledge necessary to establish interactions between the ingestion of pharmaceuticals in these athletes and nutrients, to avoid nutrient deficits
- ♦ Understand the body composition of para-athletes in different sport categories
- ♦ Apply current scientific evidence on nutritional ergogenic aids





03

# Course Management

The direction and faculty of this program are composed of leading professionals who are part of TECH's team of experts in Muscle Physiology and Metabolism. These specialists have poured their knowledge and experience into all content to create a unique and innovative study plan.







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*Succeed with the best and acquire  
the knowledge and skills you need to  
succeed in the field of Physiotherapy”*

## International Guest Director

Jamie Meeks has proven throughout her career her dedication to Sports Nutrition. After graduating from Louisiana State University with a degree in Sports Nutrition, he quickly rose to prominence. Her talent and commitment were recognized when she received the prestigious Young Dietitian of the Year award from the Louisiana Dietetic Association, an achievement that marked the beginning of a successful career.

After completing her bachelor's degree, Jamie Meeks continued her education at the University of Arkansas, where she completed her internship in Dietetics. She then went on to obtain a Master's Degree in Kinesiology with a specialization in Exercise Physiology from Louisiana State University. Her passion for helping athletes reach their full potential and her tireless commitment to excellence make her a leading figure in the sports and nutrition community.

Her deep knowledge in this area led her to become the first Director of Sports Nutrition in the history of Louisiana State University's athletic department. There, she developed innovative programs to meet the dietary needs of athletes and educate them on the importance of proper nutrition for optimal performance.

Subsequently, she has held the position of Director of Sports Nutrition for the NFL's New Orleans Saints. In this role, she is dedicated to ensuring that professional players receive the best nutritional care possible, working closely with coaches, trainers, physical trainers and medical staff to optimize individual performance and health.

As such, Jamie Meeks is considered a true leader in her field, being an active member of several professional associations and participating in the advancement of Sports Nutrition on a national level. In this regard, she is also a member of the Academy of Nutrition and Dietetics and the Association of Collegiate and Professional Sports Dietitians.



## Dr. Meeks, Jamie

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- Director of Sports Nutrition for the New Orleans Saints of the NFL, Louisiana, United States
- Coordinator of Sports Nutrition at Louisiana State University
- Registered Dietitian by the Academy of Nutrition and Dietetics
- Certified Specialist in Sports Dietetics
- Master's Degree in Kinesiology with a specialization in Exercise Physiology from Louisiana State University
- Graduate in Dietetics from Louisiana State University
- Member of: Louisiana Dietetic Association, Association of Collegiate and Professional Sports Dietitians, Cardiovascular and Wellness Sports Nutrition Dietetic Practice Group

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*Thanks to TECH, you will be able to learn with the best professionals in the world”*

## Management



### Dr. Marhuenda Hernández, Javier

- Nutritionist in Professional Football Clubs
- Responsible for the Sports Nutrition Area. Albacete Balompié Club SAD
- Responsible for the Sports Nutrition Area. Catholic University of Murcia, UCAM Murcia Football Club
- Scientific Advisor. Nutrium
- Nutritional Advisor. Impulse Center
- Professor and Coordinator of Postgraduate Studies
- PhD in Nutrition and Food Safety. San Antonio Catholic University of Murcia
- Graduate in Human Nutrition and Dietetics. San Antonio Catholic University of Murcia
- Master's Degree in Clinical Nutrition. San Antonio Catholic University of Murcia
- Academic Spanish Academy of Nutrition and Dietetics (AEND)





## Professors

### Dr. Arcusa Saura, Raúl

- ◆ Nutritionist. Castellón Sports Club
- ◆ Nutritionist in several semi-professional clubs in Castellón
- ◆ Researcher. San Antonio Catholic University of Murcia
- ◆ Undergraduate and Graduate Teaching
- ◆ Graduate in Human Nutrition and Dietetics
- ◆ Master's Degree in Nutrition in Physical Activity and Sport

### Dr. Martínez Noguera, Francisco Javier

- ◆ Sports nutritionist at CIARD-UCAM
- ◆ Sports nutritionist at Jorge Lledó Physiotherapy Clinic
- ◆ Research assistant at CIARD-UCAM
- ◆ Sports nutritionist at UCAM Murcia Soccer Club
- ◆ Nutritionist at SANO Center
- ◆ Sports nutritionist at UCAM Murcia Basketball Club
- ◆ PhD in Sports Science from the Catholic University San Antonio de Murcia
- ◆ Graduate in Human Nutrition and Dietetics from the Catholic University San Antonio of Murcia
- ◆ Master's Degree in Nutrition and Food Safety from the Catholic University San Antonio of Murcia

# 04

# Structure and Content

The structure and content of this program have been designed by leading experts in the field, who have drawn on their experience and the most rigorous and up-to-date sources. In addition, all materials have followed the requirements of the most efficient pedagogical methodology, *TECH Relearning*, which guarantees an optimal and natural assimilation of the essential concepts.







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*A syllabus developed by experts and offering the highest quality content to help you achieve your most ambitious career goals”*

## Module 1. Muscular and Metabolic Physiology Related to Exercise

- 1.1. Cardiovascular Adaptations Related to Exercise
  - 1.1.1. Increased Systolic Volume
  - 1.1.2. Decreased Heart Rate
- 1.2. Ventilatory Adaptations Related to Exercise
  - 1.2.1. Changes in the Ventilatory Volume
  - 1.2.2. Changes in Oxygen Consumption
- 1.3. Hormonal Adaptations Related to Exercise
  - 1.3.1. Cortisol
  - 1.3.2. Testosterone
- 1.4. Muscle Structure and Types of Muscle Fibers
  - 1.4.1. Muscle Fiber
  - 1.4.2. Type I Muscle Fiber
  - 1.4.3. Type II Muscle Fibers
- 1.5. The Concept of Lactic Threshold
- 1.6. ATP and Phosphagen Metabolism
  - 1.6.1. Metabolic Pathways for ATP Resynthesis during Exercise
  - 1.6.2. Phosphagen Metabolism
- 1.7. Carbohydrate Metabolism
  - 1.7.1. Carbohydrate Mobilization during Exercise
  - 1.7.2. Types of Glycolysis
- 1.8. Lipid Metabolism
  - 1.8.1. Lipolysis
  - 1.8.2. Fat Oxidation during Exercise
  - 1.8.3. Ketone Bodies
- 1.9. Protein Metabolism
  - 1.9.1. Ammonium Metabolism
  - 1.9.2. Amino Acid Oxidation
- 1.10. Mixed Bioenergetics of Muscle Fibers
  - 1.10.1. Energy Sources and their Relation to Exercise
  - 1.10.2. Factors Determining the Use of One or Another Energy Source during Exercise

## Module 2. Evaluation of the Athlete at Different Times of the Season

- 2.1. Biochemical Evaluation
  - 2.1.1. Blood Count:
  - 2.1.2. Overtraining Markers
- 2.2. Anthropometric Assessment
  - 2.2.1. Body Composition
  - 2.2.2. ISAK Profile
- 2.3. Preseason
  - 2.3.1. High Workload
  - 2.3.2. Assuring Caloric and Protein Intake
- 2.4. Competitive Season
  - 2.4.1. Sports Performance
  - 2.4.2. Recovery between Games
- 2.5. Transition Period
  - 2.5.1. Vacation Period
  - 2.5.2. Changes in Body Composition
- 2.6. Travel
  - 2.6.1. Tournaments during the Season
  - 2.6.2. Off-season Tournaments (World Cups, European Cups and The Olympic Games)
- 2.7. Athlete Monitoring
  - 2.7.1. Basal Athlete Status
  - 2.7.2. Evolution during the Season
- 2.8. Sweat Rate Calculation
  - 2.8.1. Hydric Losses
  - 2.8.2. Calculation Protocol
- 2.9. Multidisciplinary Work
  - 2.9.1. The Role of the Nutritionist in the Athlete's Environment
  - 2.9.2. Communication with the Rest of the Areas
- 2.10. Doping
  - 2.10.1. WADA List
  - 2.10.2. Anti-doping Tests



**Module 3. Parathletes**

- 3.1. Classification and Categories in Parathletes
  - 3.1.1. What is a Parathlete?
  - 3.1.2. How are Parathletes Classified?
- 3.2. Sports Science in Parathletes
  - 3.2.1. Metabolism and Physiology
  - 3.2.2. Biomechanics
  - 3.2.3. Psychology
- 3.3. Energy Requirements and Hydration in Parathletes
  - 3.3.1. Optimal Energy Demands for Training
  - 3.3.2. Hydration Planning before, during and after Training and Competitions
- 3.4. Nutritional Problems in the Different Categories of Para Athletes According to Pathology or Anomaly
  - 3.4.1. Spinal Cord Injuries
  - 3.4.2. Cerebral Palsy and Acquired Brain Injuries
  - 3.4.3. Amputees
  - 3.4.4. Vision and Hearing Impairment
  - 3.4.5. Intellectual Impairments
- 3.5. Nutritional Planning in Para Athletes with Spinal Cord Injury and Cerebral Palsy and Acquired Brain Injuries
  - 3.5.1. Nutritional Requirements (Macro and Micronutrients)
  - 3.5.2. Sweating and Fluid Replacement during Exercise
- 3.6. Nutritional Planning in Amputee Parathletes
  - 3.6.1. Energy Requirements
  - 3.6.2. Macronutrients
  - 3.6.3. Thermoregulation and Hydration
  - 3.6.4. Nutritional Issues Related to Prosthetics
- 3.7. Planning and Nutritional Problems in Para Athletes with Vision-Hearing Impairment and Intellectual Impairment
  - 3.7.1. Sports Nutrition Problems With Vision Impairment: Retinitis Pigmentosa, Diabetic Retinopathy, Albinism, Stargardt's Disease and Hearing Pathologies
  - 3.7.2. Sports Nutrition Problems With Intellectual Deficiencies: Down Syndrome, Autism and Asperger and Phenylketonuria
- 3.8. Body Composition in Parathletes
  - 3.8.1. Measurement Techniques
  - 3.8.2. Factors Influencing the Reliability of Different Measurement Methods
- 3.9. Pharmacology and Nutrient Interactions
  - 3.9.1. Different Types of Drugs Taken by Parathletes
  - 3.9.2. Micronutrient Deficiencies in Parathletes
- 3.10. Ergogenic Aids
  - 3.10.1. Potentially Beneficial Supplements for Parathletes
  - 3.10.2. Adverse Effects on Health and Contamination and Doping Problems Due to the Intake of Ergogenic Aids



*A program designed under on  
the most efficient pedagogical  
methodology, TECH's Relearning”*

# 05 Methodology

This academic program offers students a different way of learning. Our methodology uses a cyclical learning approach: **Relearning**.

This teaching system is used, for example, in the most prestigious medical schools in the world, and major publications such as the **New England Journal of Medicine** have considered it to be one of the most effective.





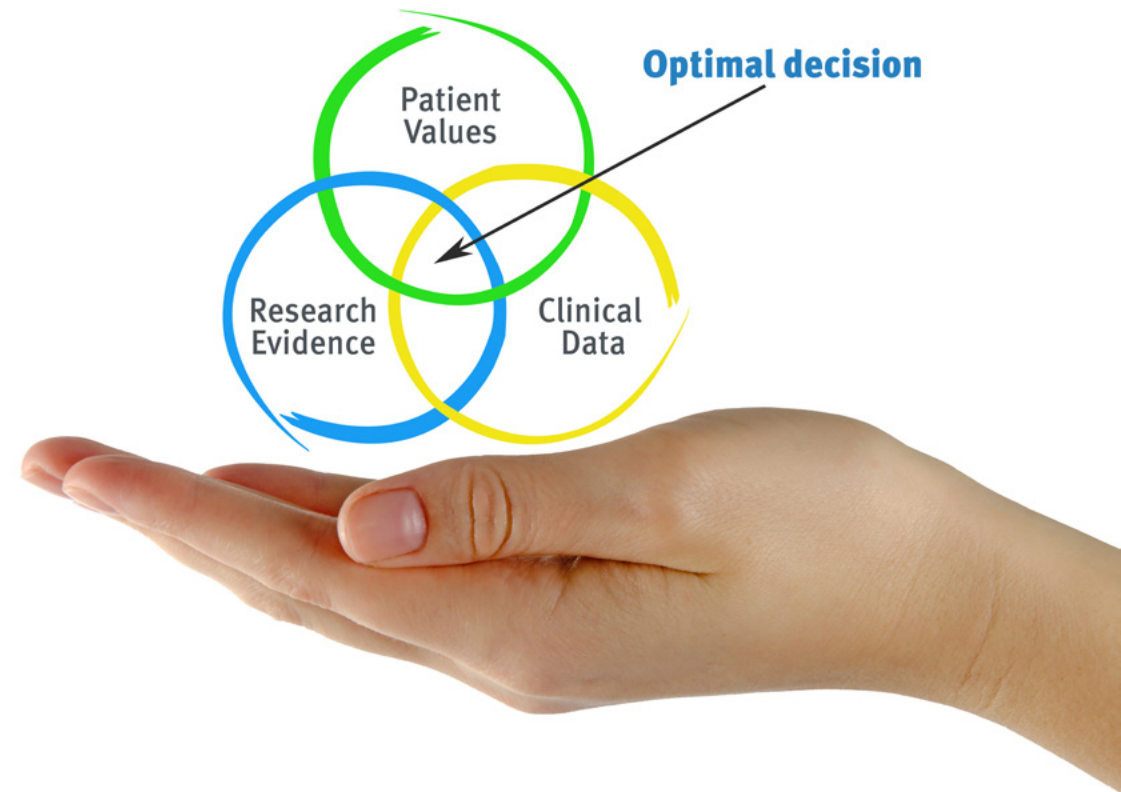
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*Discover Relearning, a system that abandons conventional linear learning, to take you through cyclical teaching systems: a way of learning that has proven to be extremely effective, especially in subjects that require memorization"*

## At TECH we use the Case Method

What should a professional do in a given situation? Throughout the program, students will face multiple simulated clinical cases, based on real patients, in which they will have to do research, establish hypotheses, and ultimately resolve the situation. There is an abundance of scientific evidence on the effectiveness of the method. Physiotherapists/kinesiologists learn better, faster, and more sustainably over time.

*With TECH you will experience a way of learning that is shaking the foundations of traditional universities around the world.*



According to Dr. Gérvas, the clinical case is the annotated presentation of a patient, or group of patients, which becomes a "case", an example or model that illustrates some peculiar clinical component, either because of its teaching power or because of its uniqueness or rarity. It is essential that the case is based on current professional life, trying to recreate the real conditions of professional physiotherapy practice.



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*Did you know that this method was developed in 1912, at Harvard, for law students? The case method consisted of presenting students with real-life, complex situations for them to make decisions and justify their decisions on how to solve them. In 1924, Harvard adopted it as a standard teaching method”*

The effectiveness of the method is justified by four fundamental achievements:

1. Physiotherapists/kinesiologists who follow this method not only grasp concepts, but also develop their mental capacity, by evaluating real situations and applying their knowledge.
2. The learning process has a clear focus on practical skills that allow the physiotherapist/kinesiologist to better integrate into the real world.
3. Ideas and concepts are understood more efficiently, given that the example situations are based on real-life.
4. Students like to feel that the effort they put into their studies is worthwhile. This then translates into a greater interest in learning and more time dedicated to working on the course.



## Relearning Methodology

At TECH we enhance the case method with the best 100% online teaching methodology available: Relearning.

This university is the first in the world to combine the study of clinical cases with a 100% online learning system based on repetition, combining a minimum of 8 different elements in each lesson, a real revolution with respect to the mere study and analysis of cases.



*The physiotherapist/kinesiologist will learn through real cases and by solving complex situations in simulated learning environments. These simulations are developed using state-of-the-art software to facilitate immersive learning.*



At the forefront of world teaching, the Relearning method has managed to improve the overall satisfaction levels of professionals who complete their studies, with respect to the quality indicators of the best online university (Columbia University).

With this methodology we trained more than 65,000 physiotherapists/kinesiologists with unprecedented success in all clinical specialties, regardless of the workload. Our pedagogical methodology is developed in a highly competitive environment, with a university student body with a strong socioeconomic profile and an average age of 43.5 years old.

*Relearning will allow you to learn with less effort and better performance, involving you more in your training, developing a critical mindset, defending arguments, and contrasting opinions: a direct equation for success.*

In our program, learning is not a linear process, but rather a spiral (learn, unlearn, forget, and re-learn). Therefore, we combine each of these elements concentrically.

The overall score obtained by our learning system is 8.01, according to the highest international standards.



This program offers the best educational material, prepared with professionals in mind:



#### Study Material

All teaching material is produced by the specialists who teach the course, specifically for the course, so that the teaching content is really specific and precise.

These contents are then applied to the audiovisual format, to create the TECH online working method. All this, with the latest techniques that offer high quality pieces in each and every one of the materials that are made available to the student.



#### Physiotherapy Techniques and Procedures on Video

TECH brings students closer to the latest techniques, the latest educational advances and to the forefront of current Physiotherapy techniques and procedures. All of this in direct contact with students and explained in detail so as to aid their assimilation and understanding. And best of all, you can watch them as many times as you want.



#### Interactive Summaries

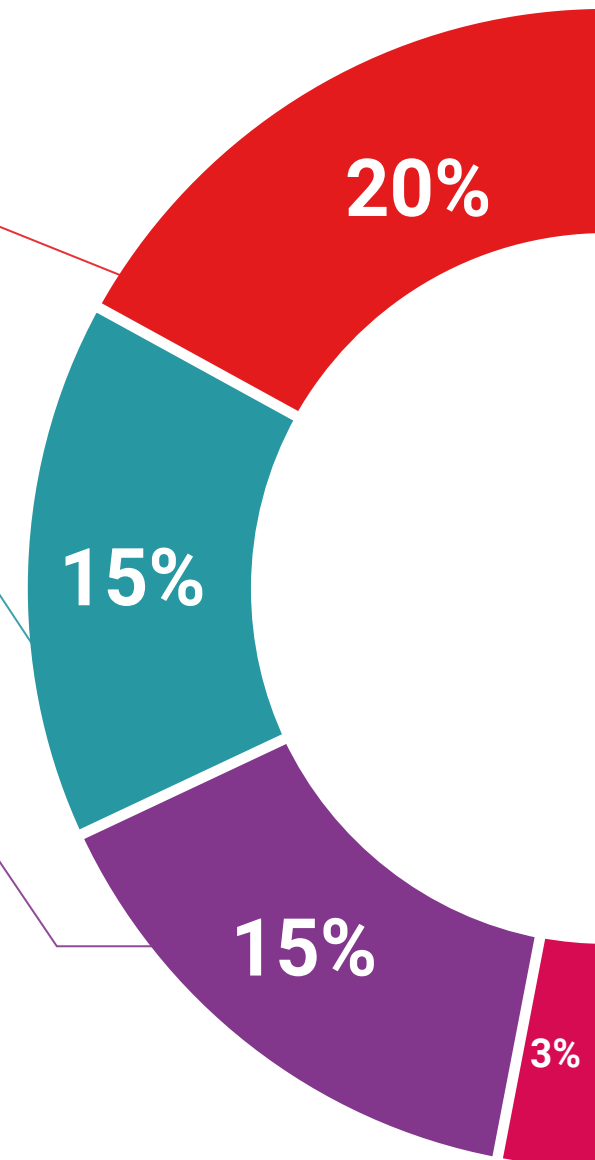
The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

This unique multimedia content presentation training system was awarded by Microsoft as a "European Success Story".

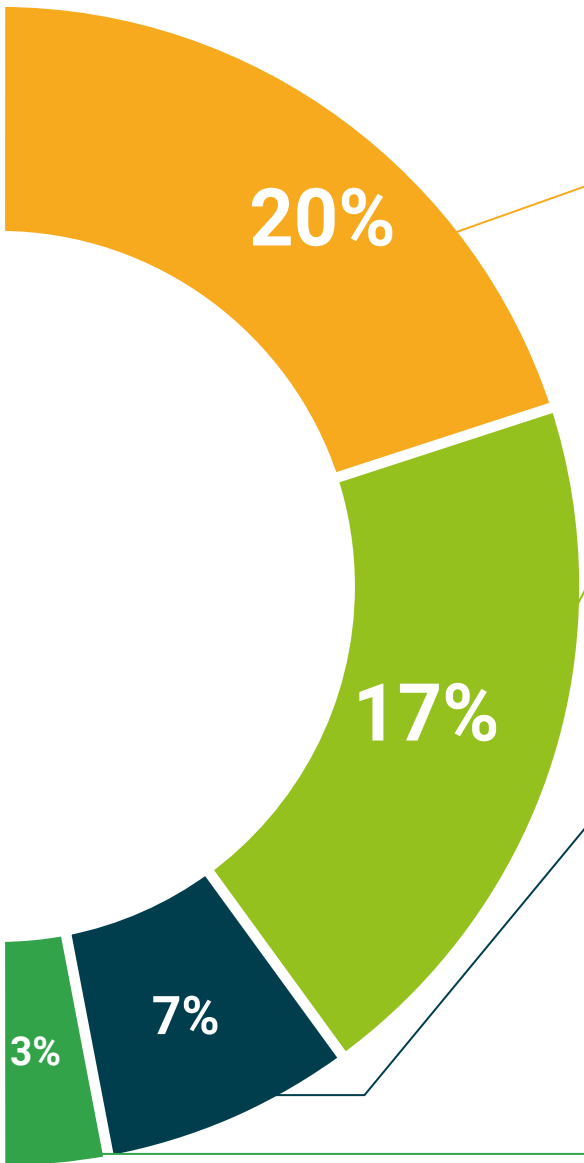


#### Additional Reading

Recent articles, consensus documents and international guidelines, among others. In TECH's virtual library, students will have access to everything they need to complete their course.







#### Expert-Led Case Studies and Case Analysis

Effective learning ought to be contextual. Therefore, TECH presents real cases in which the expert will guide students, focusing on and solving the different situations: a clear and direct way to achieve the highest degree of understanding.



#### Testing & Retesting

We periodically evaluate and re-evaluate students' knowledge throughout the program, through assessment and self-assessment activities and exercises, so that they can see how they are achieving their goals.



#### Classes

There is scientific evidence on the usefulness of learning by observing experts. The system known as Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.



#### Quick Action Guides

TECH offers the most relevant contents of the course in the form of worksheets or quick action guides. A synthetic, practical, and effective way to help students progress in their learning.



# 06 Certificate

The Postgraduate Diploma in Muscular and Metabolic Physiology guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Diploma issued by TECH Global University.



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*Successfully complete this program and receive your university qualification without having to travel or fill out laborious paperwork”*



This program will allow you to obtain your **Postgraduate Diploma in Muscular and Metabolic Physiology** endorsed by **TECH Global University**, the world's largest online university.

**TECH Global University** is an official European University publicly recognized by the Government of Andorra (**official bulletin**). Andorra is part of the European Higher Education Area (EHEA) since 2003. The EHEA is an initiative promoted by the European Union that aims to organize the international training framework and harmonize the higher education systems of the member countries of this space. The project promotes common values, the implementation of collaborative tools and strengthening its quality assurance mechanisms to enhance collaboration and mobility among students, researchers and academics.

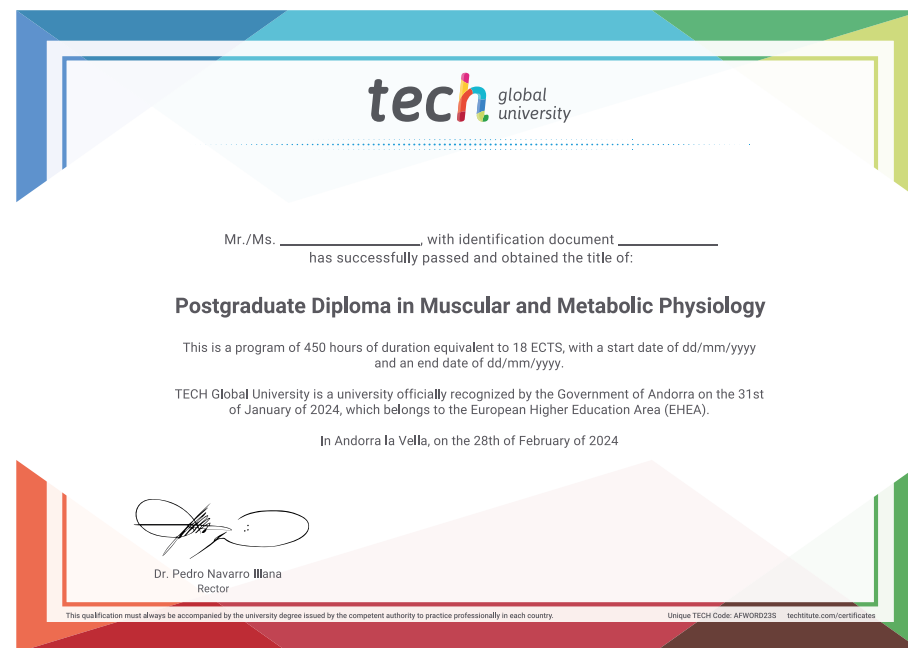
This **TECH Global University** title is a European program of continuing education and professional updating that guarantees the acquisition of competencies in its area of knowledge, providing a high curricular value to the student who completes the program.

Title: **Postgraduate Diploma in Muscular and Metabolic Physiology**

Modality: **online**

Duration: **6 months**

Accreditation: **18 ECTS**



\*Apostille Convention. In the event that the student wishes to have their paper diploma issued with an apostille, TECH Global University will make the necessary arrangements to obtain it, at an additional cost.



future  
health confidence people  
education information tutors  
guarantee accreditation teaching  
institutions technology learning  
community commitment  
personalized service innovation  
knowledge present  
development languages  
virtual classroom

**tech** global  
university

**Postgraduate Diploma**  
Muscular and Metabolic  
Physiology

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