# Postgraduate Certificate
## Biomechanics

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# Postgraduate Certificate
## Biomechanics

Course Modality: Online

Duration: 6 weeks

Certificate: TECH Technological University

6 ECTS Credits

Teaching Hours: 150 hours

Website: www.techtitute.com/us/medicine/postgraduate-certificate/biomechanics

# Index

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# Introduction

The development of medical biomechanics has had a potential positive impact on the rehabilitation of patients with musculoskeletal system problems, as well as on the prescription and use of orthoses and prostheses. However, despite its wide application in the medical field, the high theoretical component of biophysics in this field makes it difficult for many specialists to know and understand in detail the procedures and techniques that are most successful in medical practices, which is why this course has arisen. This is a high quality online program rigorously designed for the specialist to acquire the necessary knowledge that will allow him to be fluent in biomechanical concepts and to improve the treatment offered to his patients.


Evaluate the main problems related to biomechanics and identify the most common courses of action”

The development of biomechanics aimed at the study and repair of fractures, as well as rehabilitation and the use of orthoses or prostheses, has enabled millions of people around the world to return to a completely normal life after an operation, accident or illness. Continuous research allows this field of medicine to be in constant evolution, which favors patients, but makes it difficult for specialists. Why? In many cases, their day-to-day work does not allow them to undergo training to keep them up to date with the latest developments in the sector, leaving their techniques and treatments totally out of date.

In order to facilitate their academic activity, TECH has launched this Postgraduate Certificate in Biomechanics, designed and directed by experts. It is intended to provide specialized knowledge about the most relevant concepts in the field of biomechanics, as well as the different types of forces and movements that influence it. The program also includes the evaluation of common problems and their main lines of action.

With a pedagogical methodology at the forefront of the university sector, TECH and its teaching team will guide the graduate, through this 100% online degree, to meet their objectives. Therefore, the teaching load will be duly distributed and can be organized according to their own schedules. In addition, you will have individualized tutoring, dynamic summaries and supplementary material to expand each module as you wish.

This Postgraduate Certificate in Biomechanics is the most comprehensive and up-to-date educational program on the market. The most important features include:

- Practical cases presented by experts in Biomedicine
- The graphic, schematic, and eminently 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

> Get all the knowledge you need to develop your own diagnostics and treatments related to biomechanics"

Increase your chances of success with this University Course and do not miss the opportunity provided by 150 hours of the best content in biomechanics"

Take advantage of the faculty's experience to resolve doubts and raise possible lines of action based on your own experience

Access the Virtual Classroom from any device Download the content and follow the lessons from wherever you want

The program's teaching staff includes professionals from the sector who contribute their work experience to this training program, as well as renowned 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 training programmed to train 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 student will be assisted by an innovative interactive video system created by renowned and experienced experts.

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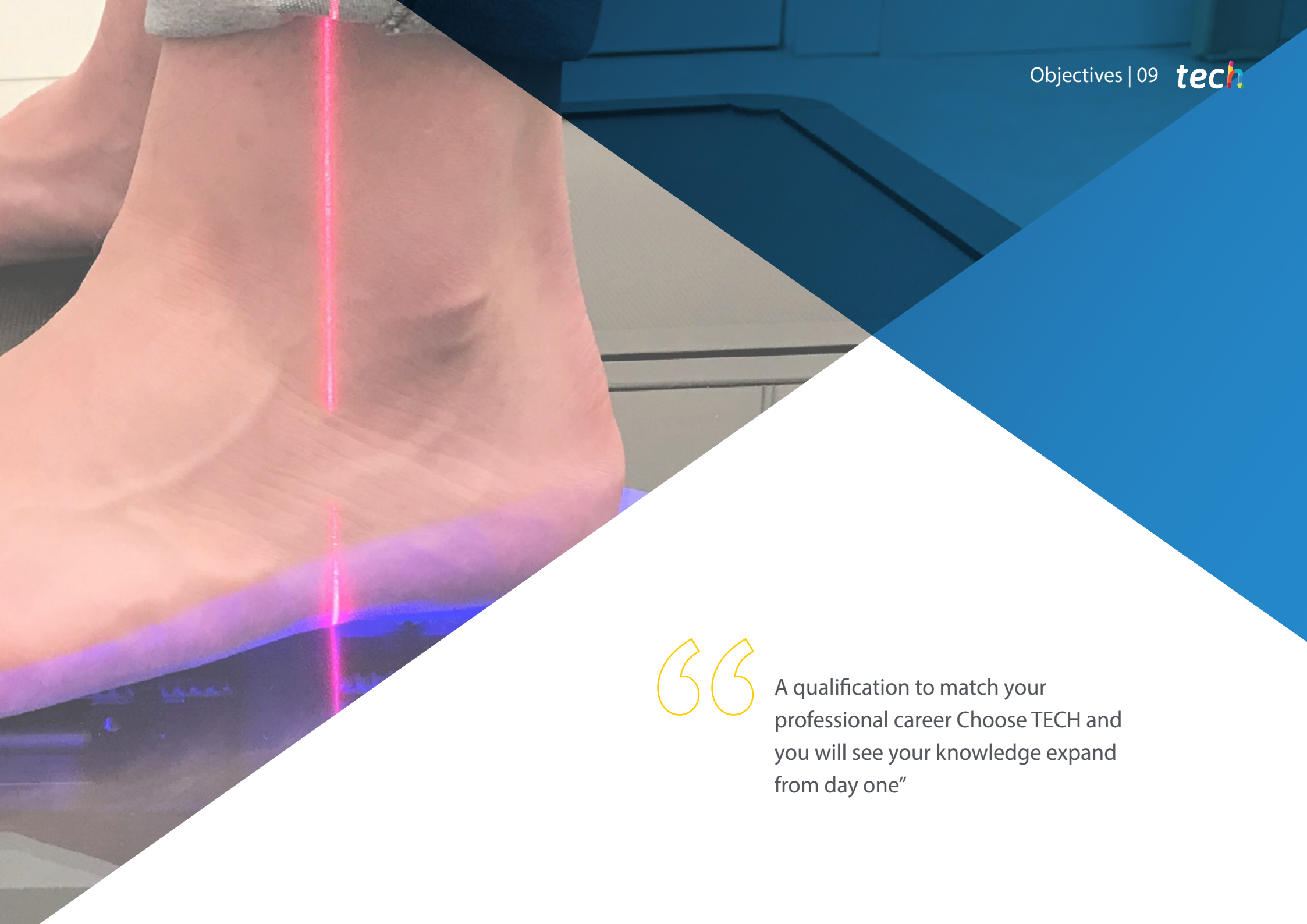
# Objectives

TECH's objective with this and all its courses is to offer the best academic experience, with which the graduate can perfect their skills and, therefore, prosper in their professional practice. In syllabuses such as those developed in this Postgraduate Certificate in which the concepts come from such a complex field as biomechanical engineering, the content is adapted so that the medical specialist is able to understand it without any problem.



A qualification to match your professional career Choose TECH and you will see your knowledge expand from day one”

## General Objectives

- Generate specialized knowledge on the main types of biomedical signals and their uses
- Develop the physical and mathematical knowledge underlying biomedical signals
- Fundamentals of the principles governing signal analysis and processing systems
- Analyze the main applications, trends and lines of research and development in the field of biomedical signals
- Develop expertise in classical mechanics and fluid mechanics
- Analyze the general functioning of the motor system and its biological mechanisms
- Develop models and techniques for the design and prototyping of interfaces based on design methodologies and their evaluation
- Provide the student with critical skills and tools for interface assessment
- Explore the interfaces used in pioneering technology in the biomedical sector
- Analyze the fundamentals of medical imaging acquisition, inferring its social impact
- Develop specialized knowledge about the operation of the different imaging techniques, understanding the physics behind each modality
- Identify the usefulness of each method in relation to its characteristic clinical applications
- Investigate post-processing and management of acquired images
- Use and design biomedical information management systems
- Analyze current digital health applications and design biomedical applications in a hospital setting or clinical center

> Discover how far you are capable of going with the additional content TECH makes available to you”


## Specific Objectives

- Generate specialized knowledge on the concept of biomechanics
- Examine the different types of movements and the forces involved in them
- Understanding the functioning of the circulatory system
- Develop biomechanical analysis methods
- Analyze muscle positions to understand their effect on resultant forces
- Evaluate common problems related to biomechanics
- Identify the main lines of action of biomechanics

03

# Course Management

The management of this Postgraduate Certificate is composed of professionals with extensive experience in Biomechanics, with experience in research projects and with which the student is assured of receiving the best possible teaching in this field. This teaching team, characterized by a great human quality, will invest their time and effort in guaranteeing the specialist an enriching and fruitful academic experience.


You will have the constant support of a faculty that will solve all your doubts throughout the course"

## International Guest Director

Awarded by the Academy of Radiology Research for his contribution to the understanding of this area of science, Dr. Zahi A Fayad is considered a prestigious Biomedical Engineer. In this sense, most of his line of research has focused on both the detection and prevention of Cardiovascular Diseases. In this way, he has made multiple contributions in the field of Multimodal Biomedical Imaging, promoting the correct use of technological tools such as Magnetic Resonance Imaging or Positron Emission Computed Tomography in the health community.

In addition, he has an extensive professional background that has led him to occupy relevant positions such as the Director of the Institute of Biomedical Engineering and Imaging at Mount Sinai Medical Center, located in New York. It should be noted that he combines this work with his facet as a Research Scientist at the National Institutes of Health of the United States government. He has written more than 500 exhaustive clinical articles on subjects such as drug development, the integration of the most avant-garde techniques of Multimodal Cardiovascular Imaging in clinical practice or non-invasive in vivo methods in clinical trials for the development of new therapies to treat Atherosclerosis. Thanks to this, his work has facilitated the understanding of the effects of Stress on the immune system and Cardiac Pathologies significantly.

On the other hand, this specialist leads 4 multicenter clinical trials funded by the US pharmaceutical industry for the creation of new cardiovascular drugs. His objective is to improve therapeutic efficacy in conditions such as Hypertension, Heart Failure or Stroke. At the same time, it develops prevention strategies to raise public awareness of the importance of maintaining healthy lifestyle habits to promote optimal cardiac health.

## Dr. A Fayad, Zahi

- Director of the Institute for Biomedical Engineering and Imaging at Mount Sinai Medical Center, New York
- Chairman of the Scientific Advisory Board of the National Institute of Health and Medical Research at the European Hospital Pompidou AP-HP in Paris, France
- Principal Investigator at Women's Hospital in Texas, United States
- Associate Editor of the "Journal of the American College of Cardiology"
- Ph.D. in Bioengineering from the University of Pennsylvania
- B.S. in Electrical Engineering from Bradley University
- Founding member of the Scientific Review Center of the National Institutes of Health of the United States government

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

## Management

### Ruiz Díez, Carlos

- Researcher at the National Microelectronics Center of the CSIC.
- Researcher. Composting Research Group of the Department of Chemical, Biological and Environmental Engineering of the UAB.
- Founder and product development at NoTime Ecobrand, a fashion and recycling brand.
- Development cooperation project manager for the NGO Future Child Africa in Zimbabwe.
- Graduate in Industrial Technologies Engineering from Universidad Pontificia de Comillas ICAI.
- Master's Degree in Biological and Environmental Engineering from the Autonomous University of Barcelona.
- Master's Degree in Environmental Management from the Universidad Española a Distancia (Spanish Open University)

## Professors

### Sirera Pérez, Ángela

- Technaid. Design and manufacture of specific parts for 3D printing.
- Use of Inventor CAD Design Software. Knowledge of the mechanics of lower limb exoskeletons for the Rehabilitation of persons with reduced mobility.
- Nuclear Medicine. Clinical University of Navarra. Analysis of Nuclear Medicine images. Dose assessment of patients with PET brain studies. Research on the optimization of methionine activity.
- Degree in Biomedical Engineering from the University of Navarra

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# Structure and Content

The structure of this Postgraduate Certificate has been built based on the recommendations of the management team and following their professional guidelines. As a result, the graduate will find in this course a modern and complete syllabus in which the concepts are developed in a clear manner. In addition, the tutors will accompany the theory with real cases taken from their own day-to-day life, giving the program a more practical and dynamic character.

A syllabus designed by and for specialists who wish to implement biomechanics into their professional careers"

## Module 1. Biomechanics

1.1. Biomechanics
- 1.1.1. Biomechanics
- 1.1.2. Qualitative and Quantitative Analysis

1.2. Basic Mechanics
- 1.2.1. Functional Mechanisms
- 1.2.2. Basic Units
- 1.2.3. The Nine Fundamentals of Biomechanics

1.3. Mechanical Fundamentals Linear and Angular Kinematics
- 1.3.1. Linear Movement
- 1.3.2. Relative Movement
- 1.3.3. Angular Movement

1.4. Mechanical Fundamentals Linear Kinetics
- 1.4.1. Newton's Law
- 1.4.2. Principle of Inertia
- 1.4.3. Energy and Work
- 1.4.4. Stress Angle Analysis

1.5. Mechanical Fundamentals Angular Kinetics
- 1.5.1. Torque
- 1.5.2. Angular Momentum
- 1.5.3. Newton's Angles
- 1.5.4. Balance and Gravity

1.6. Fluid Mechanics
- 1.6.1. Fluid
- 1.6.2. Flows
  - 1.6.2.1. Laminar Flow
  - 1.6.2.2. Turbulent Flow
  - 1.6.2.3. Pressure-Velocity: the Venturi Effect
- 1.6.3. Forces in Fluids


1.7. Human Anatomy Limitations
- 1.7.1. Human Anatomy
- 1.7.2. Muscles: Active and Passive Stress
- 1.7.3. Mobility Range
- 1.7.4. Mobility-Strength Principles
- 1.7.5. Limitations in the Analysis

1.8. Mechanisms of the Motor System Bone, Muscle-Tendon and Ligament Mechanics
- 1.8.1. Tissue Functioning
- 1.8.2. Biomechanics of Bones
- 1.8.3. Biomechanics of the Muscle-Tendon Unit
- 1.8.4. Biomechanics of Ligaments

1.9. Mechanisms of the Motor System Mechanics of Muscles
- 1.9.1. Mechanical Characteristics of Muscles
  - 1.9.1.1. Force-Speed Relationship
  - 1.9.1.2. Force-Distance Relationship
  - 1.9.1.3. Force-Time Relationship
  - 1.9.1.4. Traction-Compression Cycles
  - 1.9.1.5. Neuromuscular Control
  - 1.9.1.6. The Spine and Backbone

1.10. Mechanics of Biofluids
- 1.10.1. Mechanics of Biofluids
  - 1.10.1.1. Transport, Stress and Pressure
  - 1.10.1.2. The Circulatory System
  - 1.10.1.3. Blood Characteristics
- 1.10.2. General Problems in Biomechanics
  - 1.10.2.1. Problems in Nonlinear Mechanical Systems
  - 1.10.2.2. Problems in Biofluidics
  - 1.10.2.3. Solid-Liquid Problems

05

# Methodology

This training program provides you with a different way of learning. Our methodology uses a cyclical learning approach: Re-learning.
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.

Discover Re-learning, 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 abundant scientific evidence on the effectiveness of the method. Specialists 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 in the physician's professional practice.

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:

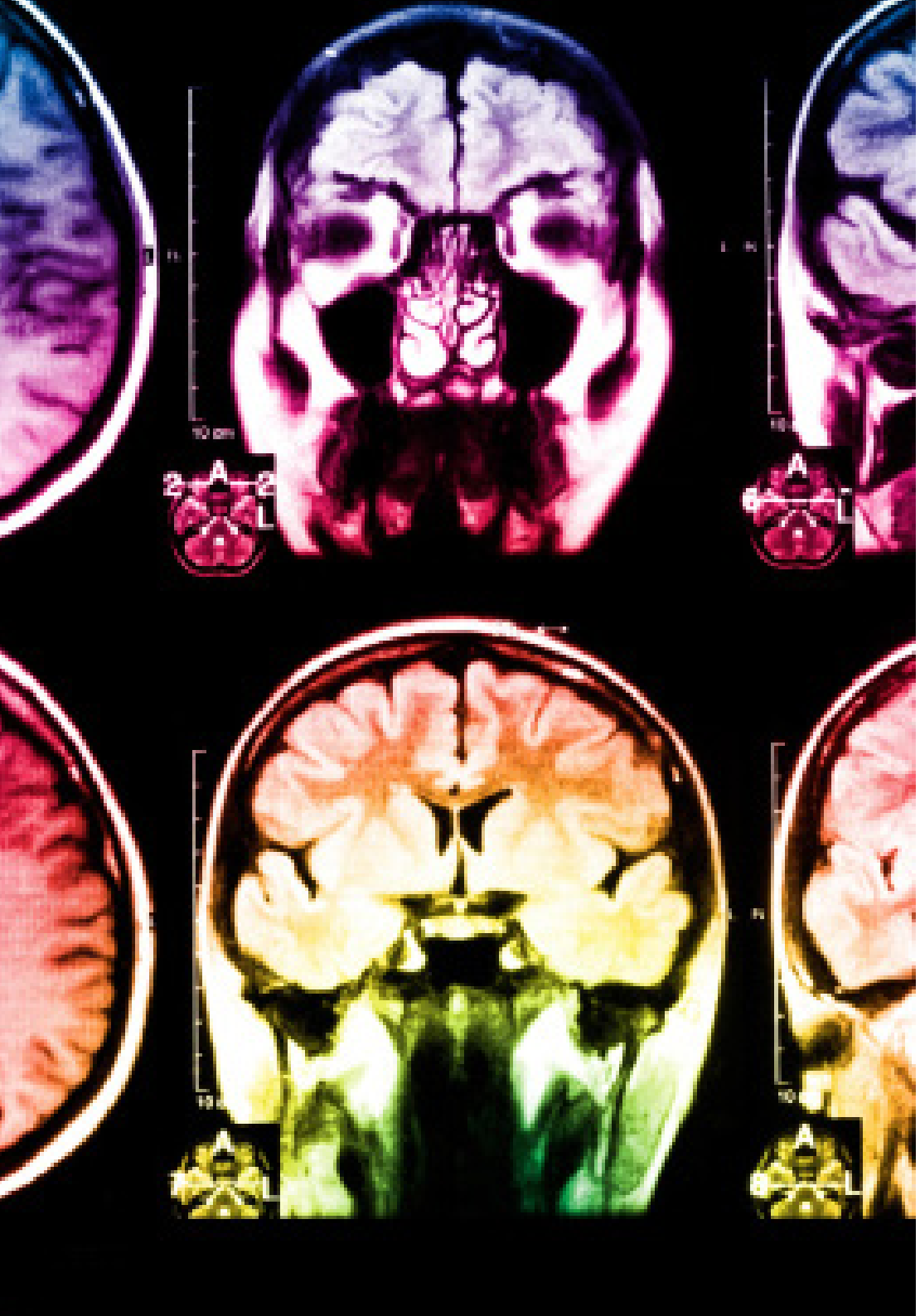
1. Students who follow this method not only achieve the assimilation of concepts, but also a development of their mental capacity, through exercises that evaluate real situations and the application of knowledge.
2. Learning is solidly translated into practical skills that allow the student to better 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.

## Re-learning Methodology

At TECH we enhance the Harvard case method with the best 100% online teaching methodology available: Re-learning.

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.

Professionals will learn through real cases and by resolving 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 Re-learning method has managed to improve the overall satisfaction levels of professionals who complete their studies, with respect to the quality indicators of the best Spanish-speaking online university (Columbia University).

With this methodology, more than 250,000 physicians have been trained with unprecedented success in all clinical specialties regardless of surgical load. Our pedagogical methodology is developed in a highly competitive environment, with a university student body with a high socioeconomic profile and an average age of 43.5 years old.

Re-learning will allow you to learn with less effort and better performance, involving you more in your specialization, developing a critical mindset, defending arguments, and contrasting opinions: a direct equation to 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 TECH's 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 highly 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.

### Surgical Techniques and Procedures on Video

TECH introduces students to the latest techniques, the latest educational advances and to the forefront of current medical techniques. 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 the videos as many times as you like.

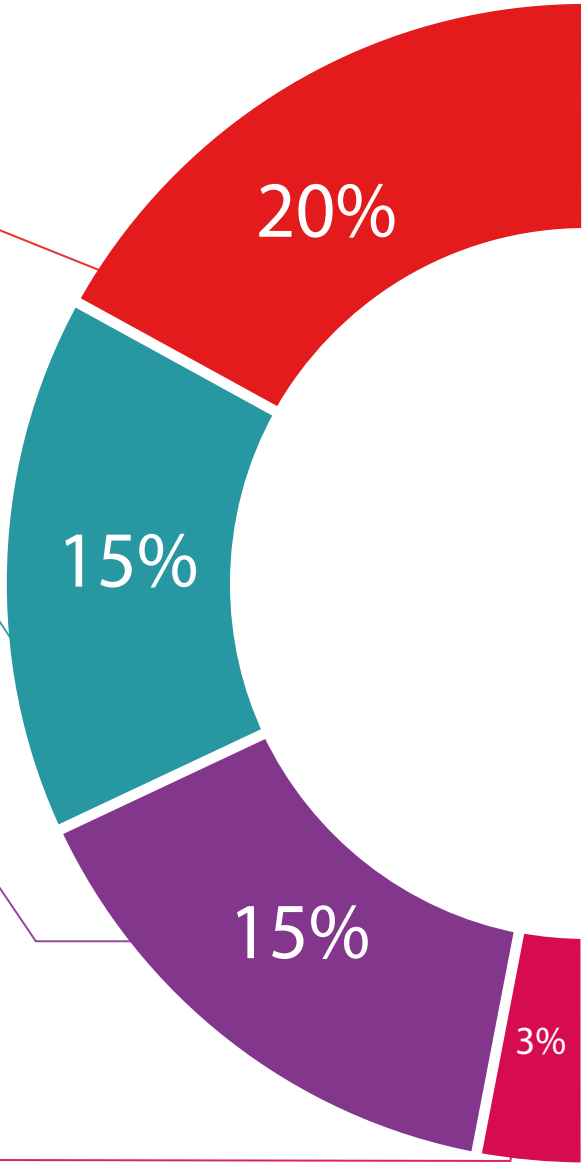
### Interactive Summaries

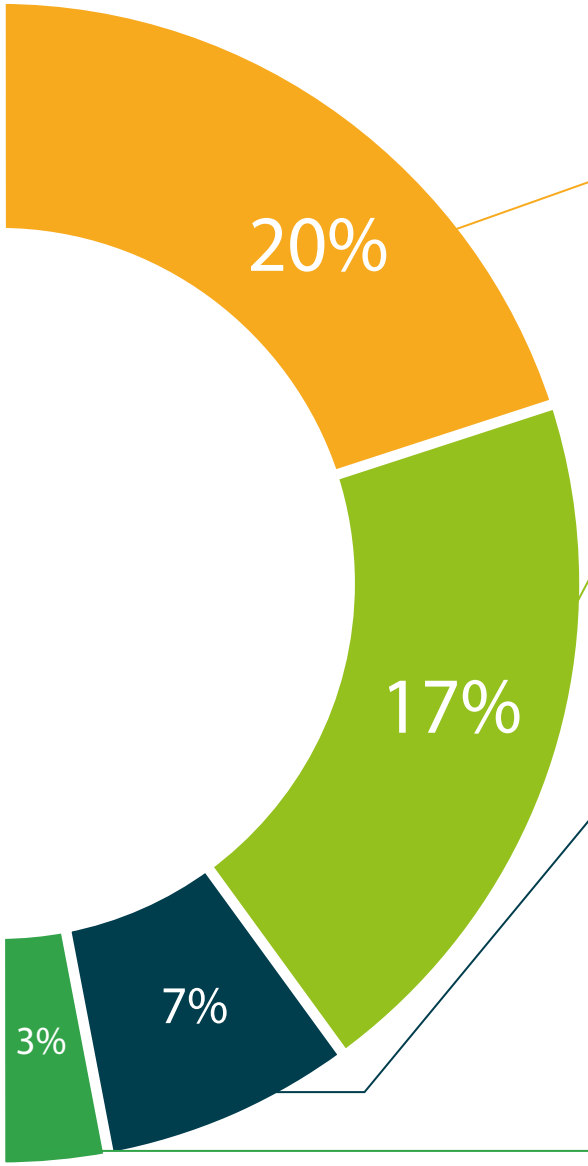
The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

This exclusive multimedia content presentation training Exclusive 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 your goals.

### Classes

There is scientific evidence on the usefulness of learning by observing experts: The system termed Learning from an Expert strengthens knowledge and recall capacity, and generates confidence in the face of difficult decisions in the future.

### 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 Certificate in Biomechanics guarantees you, in addition to the most rigorous and updated training, access to a certificate issued by TECH Technological University.

Successfully complete this training program and receive your university certificate without travel or laborious paperwork"

This Postgraduate Certificate in Biomechanics contains the most complete and updated scientific program on the market.

After passing the evaluation, the student will receive by mail* with acknowledgment of receipt the corresponding Postgraduate Certificate issued by TECH Technological University.

This qualification contributes significantly to the professional's continuing education and enhances their training with a highly regarded university syllabus, and is 100% valid for all public examinations, professional careers and job vacancies.

Title: Postgraduate Certificate in Biomechanics

ECTS: 6

Official Number of Hours: 150 hours


tech technological university

Awards the following

DIPLOMA

to

Mr./Ms. _____, with identification number _____.

For having passed and accredited the following program

POSTGRADUATE CERTIFICATE

in

Biomechanics

This is a qualification awarded by this University, with 6 ECTS credits and equivalent to 150 hours, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

TECH is a Private Institution of Higher Education recognized by the Ministry of Public Education as of June 28, 2018.

June 17, 2020

Tere Guevara Navarro

Dean

This qualification must always be accompanied by the university degree issued by the competent authority to practice professionally in each country.

Unique TECH Code: AFWORD23S techtitute.com/certificates

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