

# Postgraduate Certificate Biomaterials and Artificial Tissues in Biomedical Engineering





## Postgraduate Certificate Biomaterials and Artificial Tissues in Biomedical Engineering

- » Modality: online
- » Duration: 6 weeks
- » Certificate: TECH Global University
- » Accreditation: 6 ECTS
- » Schedule: at your own pace
- » Exams: online

Website: [www.techtute.com/us/medicine/postgraduate-certificate/biomaterials-artificial-tissues-biomedical-engineering](http://www.techtute.com/us/medicine/postgraduate-certificate/biomaterials-artificial-tissues-biomedical-engineering)

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# 01

# Introduction

Both biomaterials and artificial tissues are indispensable elements that make it possible to improve human health and the quality of life of patients in certain therapies, which are becoming more and more frequent and have a greater chance of success. The progress of these techniques in recent decades has been so significant that many specialists have had to give up keeping up to date, due to the impossibility of combining their professional activity with a degree that allows them to be up to date in this field. This program responds to that demand, offering the best content, 100% online and based on the most modern research related to this field of biomedicine.



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*Combining your work and academic life is not a problem with TECH We provide you with all the necessary tools so that you don't have to give up anything”*



The advances that have emerged around the evolution of biomaterials are extensive in many sectors, especially in medicine. The possibilities offered in clinical applications of implants have considerably improved the quality of life of millions of people around the world and therefore more and more professionals are deciding to invest in degrees that allow them to improve their techniques and knowledge, thus increasing the chances of success in the treatment they can offer their patients.

TECH's commitment to these specialists is very strong. For this reason, it offers you the best courses that allow you to broaden your concepts and update your knowledge without losing sight of your medical work. Among them is this Postgraduate Certificate, developed following the guidelines of quality and guarantee that characterize this institution and based on the latest research in biomedicine and advances with artificial tissues.

With this program, the graduate will have an overview of the different types of biomaterials applicable in medicine: metallic, ceramic, natural and synthetic polymeric and advanced (intelligent), in addition to deepening in their applications, properties and recommendations. In this way, you will obtain a very broad vision of the subject that will allow you, in only six weeks, to considerably increase and improve your knowledge.

With a group of teachers specialized in biomedicine and with the possibilities offered by this online degree, the specialist will obtain the best results and will be able, with total guarantee, to fulfill all their objectives. In addition, you will have access to high quality audiovisual material, real clinical cases and scientific articles that will help you get the most out of this academic experience.

This **Postgraduate Certificate in Biomaterials and Artificial Tissues in Biomedical Engineering** 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



*A program with which you will work with traditional biomaterials, those of biological origin and polymeric materials of synthetic origin"*

“

*TECH guarantees access to the best and most up-to-date content in the field, allowing you to learn about the latest research in natural and synthetic fabrics”*

*100% online and complete training that is perfect for physicians who want to make the most of the little time they have after finishing their working day*

*Learn about all the possibilities that arise from the introduction of biomaterials of biological origin in the treatment of your patients*

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.



# 02 Objectives

The objective of both TECH and the faculty is that with this degree the specialist will be able not only to recognize the available biomaterials and their uses, but also to be able to apply the concepts developed during this program in their own clinical cases. In addition, the purpose of this type of training is to ensure that graduates develop critical thinking skills that will allow them to obtain the best results in their day-to-day work and in the shortest possible time, guaranteeing a unique academic experience.







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*With this degree you will be forced to set more demanding goals every day And with our program you will achieve them without any difficulty"*



## General Objectives

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- ◆ 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





## Specific Objectives

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- ◆ Analyze biomaterials and their evolution throughout history
- ◆ Examining traditional biomaterials and their uses
- ◆ Determine the biomaterials of biological origin and their applications
- ◆ Deepen the knowledge of polymeric biomaterials of synthetic origin
- ◆ Determine the behavior of biomaterials in the human body, with special emphasis on their degradation

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*We have the most modern pedagogical and academic tools at the disposal of the professionals who choose TECH”*



# 03

# Course Management

This Postgraduate Certificate in Biomaterials and Artificial Tissues in Biomedical Engineering has been developed by a teaching staff with extensive experience in the field. This gives the course a more professional and practical approach, which will allow the graduate to study the program with the confidence of being tutored by the best professionals in the biomedical sector. In addition, the commitment of each of the teachers and their human qualities will guide you to achieve your objectives.



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*Who better to guide you through this program than a group of biomedical experts? They will be at your disposal during the six weeks and will provide you, at all times, with the most critical and professional view of the subject”*



## 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

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- ♦ 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



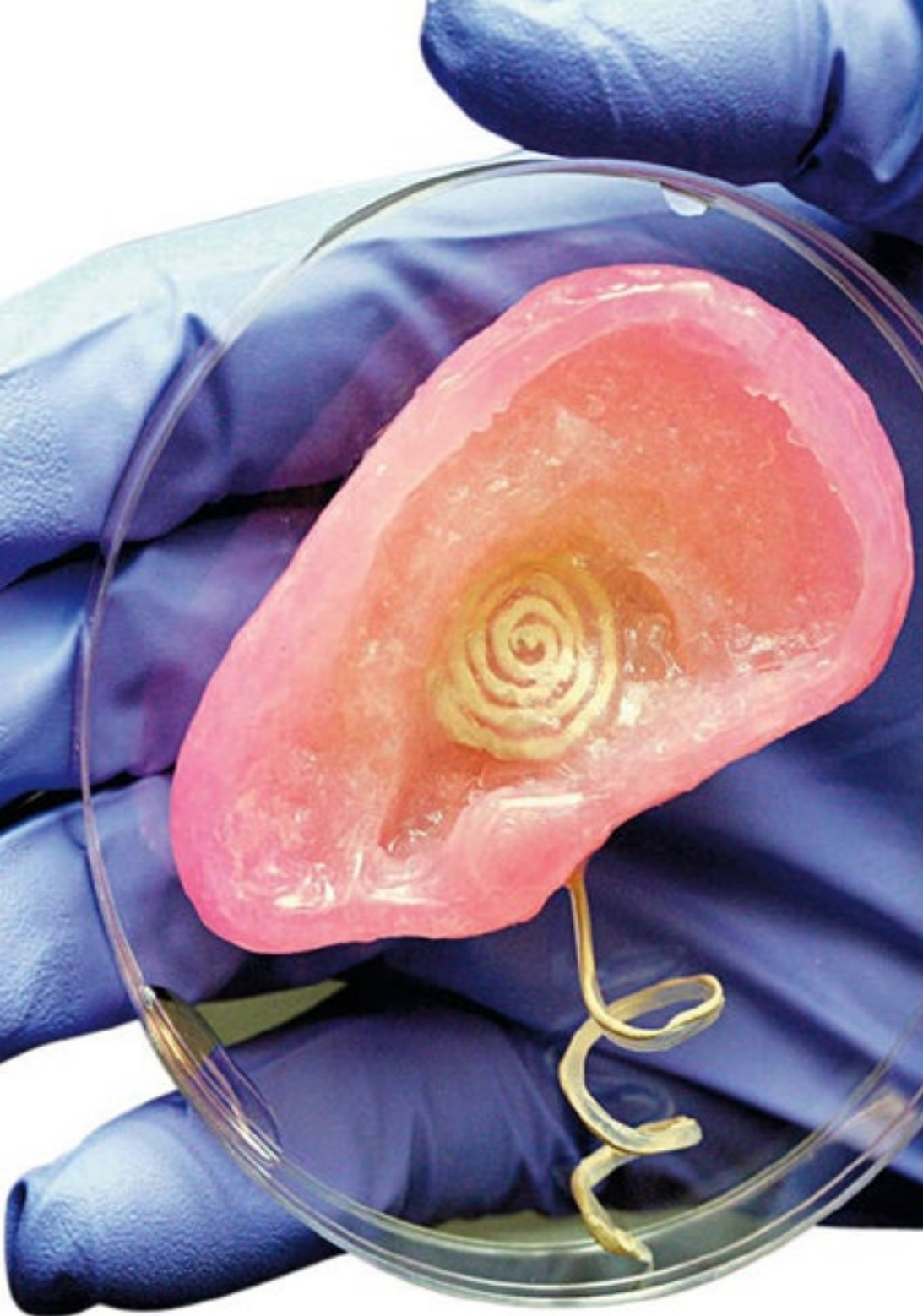
*Thanks to TECH, you will be able to learn with the best professionals in the world"*

## 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

### Vivas Hernando, Alicia

- ◆ Supply Chain and Network Optimization Analyst. Deloitte UK (Londres, Reino Unido)
- ◆ Researcher. École Polytechnique Fédérale de Lausanne (Lausanne, Switzerland).
- ◆ Researcher. Universidad Pontificia Comillas (Madrid, Spain).
- ◆ Corporate and International Development. Seguros Santalucía (Madrid, Spain).
- ◆ Degree in Industrial Technologies Engineering (Mechanical Specialty). Universidad Pontificia Comillas (Madrid, Spain).
- ◆ Professional Master's Degree in Industrial Engineering (Specialty Design). Universidad Pontificia Comillas (Madrid, Spain).
- ◆ Master in Materials Science and Engineering (Academic Exchange). École Polytechnique Fédérale de Lausanne (Lausanne, Switzerland).

# 04

# Structure and Content

The content of this syllabus has been developed by its teaching staff and based on the most modern research in the field of biomedicine and biomaterials. This, together with the cutting-edge methodology developed by TECH in each of its courses, will help the specialist to better organize the content and facilitate its study. In addition, in the Virtual Classroom you will find complementary material (readings, research, articles, videos, etc.) that will allow you to continue deepening your knowledge of the subject during this academic experience.







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*Access the best audiovisual content and dynamic summaries through the Virtual Classroom and complement the syllabus with additional quality material”*

## Module 1. Biomaterials in Biomedical Engineering

- 1.1. Biomaterials
  - 1.1.1. Biomaterials
  - 1.1.2. Types of Biomaterials and Application
  - 1.1.3. Biomaterial Selection
- 1.2. Metallic Biomaterials
  - 1.2.1. Types of Metallic Biomaterials
  - 1.2.2. Properties and Current Challenges
  - 1.2.3. Applications
- 1.3. Ceramic Biomaterials
  - 1.3.1. Types of Ceramic Biomaterials
  - 1.3.2. Properties and Current Challenges
  - 1.3.3. Applications
- 1.4. Natural Polymeric Biomaterials
  - 1.4.1. Interaction of Cells With Their Environment
  - 1.4.2. Types of Biomaterials of Biological Origin
  - 1.4.3. Applications
- 1.5. Synthetic Polymeric Biomaterials: In Vivo Behavior
  - 1.5.1. Biological Response to Foreign Bodies (FBR)
  - 1.5.2. In Vivo Behavior of Biomaterials
  - 1.5.3. Biodegradation of Polymers Hydrolysis
    - 1.5.3.1. Biodegradation Mecanisms
    - 1.5.3.2. Degradation by Diffusion and Erosion
    - 1.5.3.3. Hydrolysis Rate
  - 1.5.4. Specific Applications
- 1.6. Synthetic Polymeric Biomaterials: Hydrogels
  - 1.6.1. Hydrogels
  - 1.6.2. Classification of Hydrogels
  - 1.6.3. Hydrogel Properties
  - 1.6.4. Hydrogel Synthesis
    - 1.6.4.1. Physical Cross-Linking
    - 1.6.4.2. Enzymatic Cross-Linking
    - 1.6.4.3. Physical Cross-Linking
  - 1.6.5. Structure and Swelling of Hydrogels
  - 1.6.6. Specific Applications
- 1.7. Advanced Biomaterials: Intelligent Materials
  - 1.7.1. Shape Memory Materials
  - 1.7.2. Intelligent Hydrogels
    - 1.7.2.1. Thermo-Responsive Hydrogels
    - 1.7.2.2. PH Sensitive Hydrogels
    - 1.7.2.3. Electrically Actuated Hydrogels
  - 1.7.3. Electroactive Materials
- 1.8. Advanced Biomaterials: Nanomaterials
  - 1.8.1. Properties
  - 1.8.2. Biomedical Applications
    - 1.8.2.1. Biomedical Images
    - 1.8.2.2. Coatings
    - 1.8.2.3. Focused Ligands
    - 1.8.2.4. Stimulus-Sensitive Connections
    - 1.8.2.5. Bio markers



- 1.9. Specific Applications Neuroengineering
  - 1.9.1. The Nervous System
  - 1.9.2. New Approaches to Standard Biomaterials
    - 1.9.2.1. Soft Biomaterials
    - 1.9.2.2. Bioabsorbable Materials
    - 1.9.2.3. Implantable Materials
  - 1.9.3. Emerging Biomaterials Tissue Interaction
- 1.10. Specific Applications: Biomedical Micromachines
  - 1.10.1. Artificial Micronadators
  - 1.10.2. Contractile Microactuators
  - 1.10.3. Small Scale Manipulation
  - 1.10.4. Biological Machines

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*The opportunity to increase your chances of success in the treatment of your patients is at your fingertips By choosing TECH you will invest in guarantees, quality and commitment"*

# 05

# Study Methodology

TECH is the world's first university to combine the **case study** methodology with **Relearning**, a 100% online learning system based on guided repetition.

This disruptive pedagogical strategy has been conceived to offer professionals the opportunity to update their knowledge and develop their skills in an intensive and rigorous way. A learning model that places students at the center of the educational process giving them the leading role, adapting to their needs and leaving aside more conventional methodologies.





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*TECH will prepare you to face new challenges in uncertain environments and achieve success in your career”*



## The student: the priority of all TECH programs

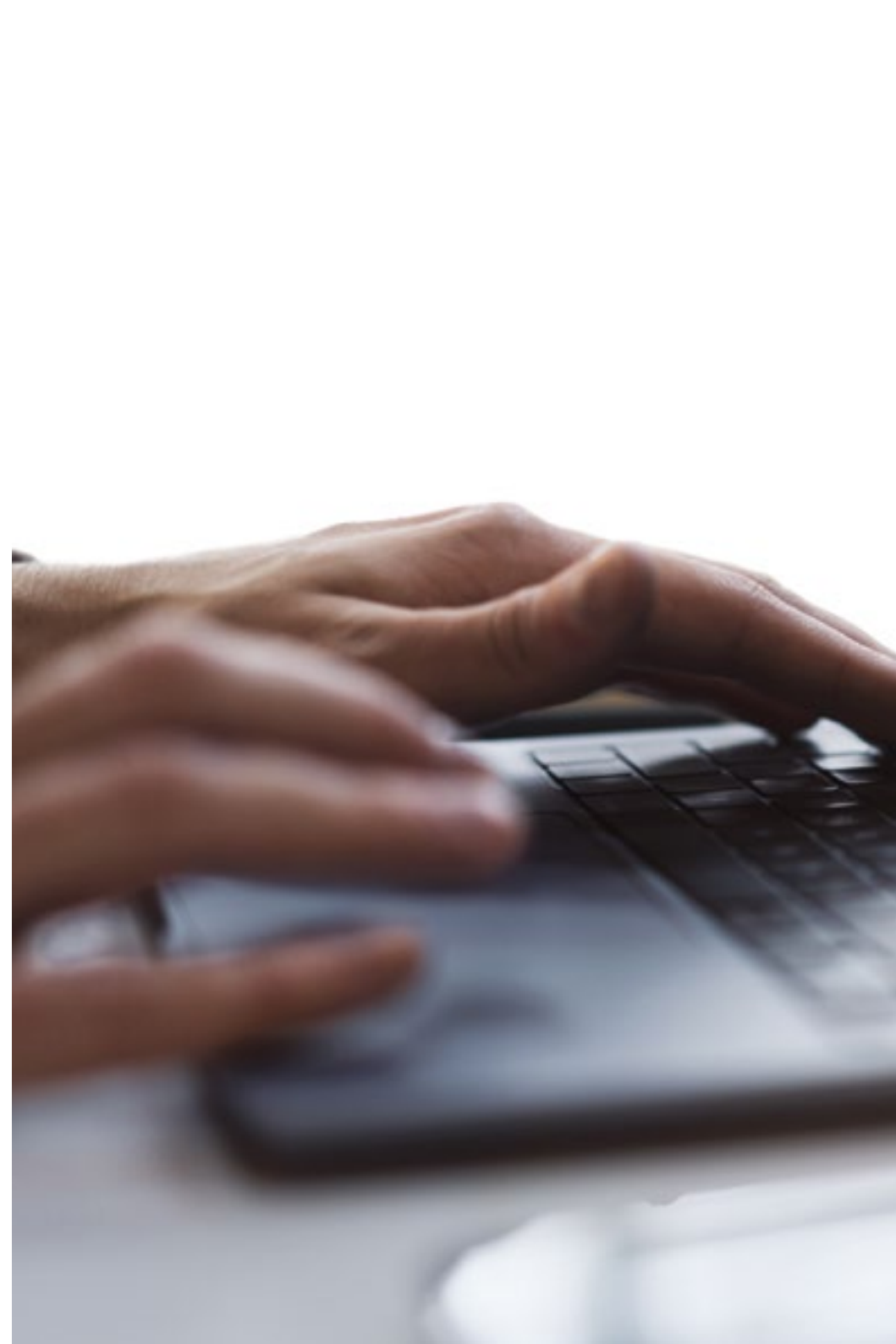
In TECH's study methodology, the student is the main protagonist.

The teaching tools of each program have been selected taking into account the demands of time, availability and academic rigor that, today, not only students demand but also the most competitive positions in the market.

With TECH's asynchronous educational model, it is students who choose the time they dedicate to study, how they decide to establish their routines, and all this from the comfort of the electronic device of their choice. The student will not have to participate in live classes, which in many cases they will not be able to attend. The learning activities will be done when it is convenient for them. They can always decide when and from where they want to study.

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*At TECH you will NOT have live classes  
(which you might not be able to attend)”*



### The most comprehensive study plans at the international level

TECH is distinguished by offering the most complete academic itineraries on the university scene. This comprehensiveness is achieved through the creation of syllabi that not only cover the essential knowledge, but also the most recent innovations in each area.

By being constantly up to date, these programs allow students to keep up with market changes and acquire the skills most valued by employers. In this way, those who complete their studies at TECH receive a comprehensive education that provides them with a notable competitive advantage to further their careers.

And what's more, they will be able to do so from any device, pc, tablet or smartphone.

“*TECH's model is asynchronous, so it allows you to study with your pc, tablet or your smartphone wherever you want, whenever you want and for as long as you want*”

## Case Studies and Case Method

The case method has been the learning system most used by the world's best business schools. Developed in 1912 so that law students would not only learn the law based on theoretical content, its function was also to present them with real complex situations. In this way, they could make informed decisions and value judgments about how to resolve them. In 1924, Harvard adopted it as a standard teaching method.

With this teaching model, it is students themselves who build their professional competence through strategies such as Learning by Doing or Design Thinking, used by other renowned institutions such as Yale or Stanford.

This action-oriented method will be applied throughout the entire academic itinerary that the student undertakes with TECH. Students will be confronted with multiple real-life situations and will have to integrate knowledge, research, discuss and defend their ideas and decisions. All this with the premise of answering the question of how they would act when facing specific events of complexity in their daily work.



## Relearning Methodology

At TECH, case studies are enhanced with the best 100% online teaching method: Relearning.

This method breaks with traditional teaching techniques to put the student at the center of the equation, providing the best content in different formats. In this way, it manages to review and reiterate the key concepts of each subject and learn to apply them in a real context.

In the same line, and according to multiple scientific researches, reiteration is the best way to learn. For this reason, TECH offers between 8 and 16 repetitions of each key concept within the same lesson, presented in a different way, with the objective of ensuring that the knowledge is completely consolidated during the study process.

*Relearning 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.*



## A 100% online Virtual Campus with the best teaching resources

In order to apply its methodology effectively, TECH focuses on providing graduates with teaching materials in different formats: texts, interactive videos, illustrations and knowledge maps, among others. All of them are designed by qualified teachers who focus their work on combining real cases with the resolution of complex situations through simulation, the study of contexts applied to each professional career and learning based on repetition, through audios, presentations, animations, images, etc.

The latest scientific evidence in the field of Neuroscience points to the importance of taking into account the place and context where the content is accessed before starting a new learning process. Being able to adjust these variables in a personalized way helps people to remember and store knowledge in the hippocampus to retain it in the long term. This is a model called Neurocognitive context-dependent e-learning that is consciously applied in this university qualification.

In order to facilitate tutor-student contact as much as possible, you will have a wide range of communication possibilities, both in real time and delayed (internal messaging, telephone answering service, email contact with the technical secretary, chat and videoconferences).

Likewise, this very complete Virtual Campus will allow TECH students to organize their study schedules according to their personal availability or work obligations. In this way, they will have global control of the academic content and teaching tools, based on their fast-paced professional update.



*The online study mode of this program will allow you to organize your time and learning pace, adapting it to your schedule”*

### 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 assess 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.



## The university methodology top-rated by its students

The results of this innovative teaching model can be seen in the overall satisfaction levels of TECH graduates.

The students' assessment of the teaching quality, the quality of the materials, the structure of the program and its objectives is excellent. Not surprisingly, the institution became the top-rated university by its students according to the global score index, obtaining a 4.9 out of 5.

*Access the study contents from any device with an Internet connection (computer, tablet, smartphone) thanks to the fact that TECH is at the forefront of technology and teaching.*

*You will be able to learn with the advantages that come with having access to simulated learning environments and the learning by observation approach, that is, Learning from an expert.*



As such, the best educational materials, thoroughly prepared, will be available in this program:



#### 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.

This content is then adapted in an audiovisual format that will create our way of working online, with the latest techniques that allow us to offer you high quality in all of the material that we provide you with.



#### Practicing Skills and Abilities

You will carry out activities to develop specific competencies and skills in each thematic field. Exercises and activities to acquire and develop the skills and abilities that a specialist needs to develop within the framework of the globalization we live in.



#### Interactive Summaries

We present the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

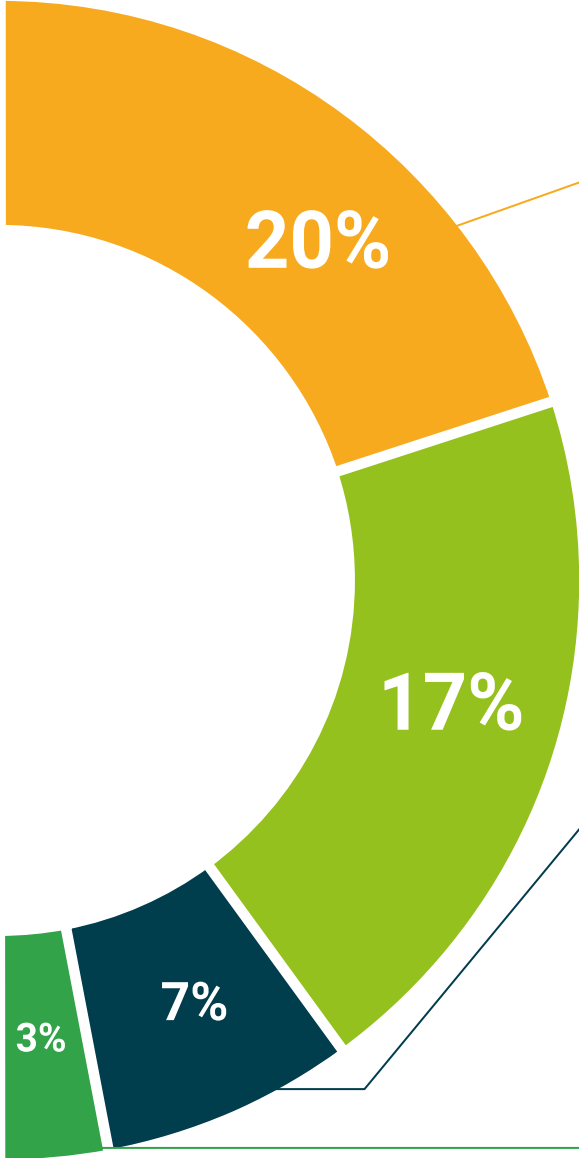
This exclusive educational system for presenting multimedia content was awarded by Microsoft as a "European Success Story".



#### Additional Reading

Recent articles, consensus documents, international guides... In our virtual library you will have access to everything you need to complete your education.





**Case Studies**

Students will complete a selection of the best case studies in the field. Cases that are presented, analyzed, and supervised by the best specialists in the world.



**Testing & Retesting**

We periodically assess and re-assess your knowledge throughout the program. We do this on 3 of the 4 levels of Miller's Pyramid.



**Classes**

There is scientific evidence suggesting that observing third-party experts can be useful.  
Learning from an expert strengthens knowledge and memory, and generates confidence for 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 Certificate in Biomaterials and Artificial Tissues in Biomedical Engineering guarantees you, in addition to the most rigorous and updated training, access to a Postgraduate Certificate issued by TECH Global University..





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



This private qualification will allow you to obtain a **Postgraduate Certificate in Biomaterials and Artificial Tissues in Biomedical Engineering** 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** private qualification 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 Certificate in Biomaterials and Artificial Tissues in Biomedical Engineering**

Modality: **online**

Duration: **6 weeks**

Accreditation: **6 ECTS**



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



**Postgraduate Certificate**  
Biomaterials and Artificial  
Tissues in Biomedical  
Engineering

- » Modality: online
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- » Certificate: TECH Global University
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- » Schedule: at your own pace
- » Exams: online

**Postgraduate Certificate**  
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Tissues in Biomedical  
Engineering