Postgraduate Certificate

Artificial Biomaterials and Tissues in Biomedical Engineering

tech technological university

tech technological university

Postgraduate Certificate

Artificial Biomaterials and Tissues in Biomedical Engineering

Course Modality: **Online**

Duration: **6 weeks**

Certificate: **TECH Technological University**

Teaching Hours: **150 hours.**

Website: www.techtitute.com/engineering/postgraduate-certificate/artificial-biomaterials-tissues-biomedical-engineering

Index

01

Introduction

One of the fields of Biomedicine that usually attracts most attention is precisely that of Biomaterials and Artificial Tissues. Advances in the refinement, composition and creation of new ceramic, polymeric, hydrogel or even smart biomaterials have opened up endless possibilities for engineers and physicians around the world. Aware of the importance that a specialization of this type can have for the future of every engineer, TECH has created this university program, which is supported by a highly qualified teaching staff. Their experience, together with TECH's refined teaching methodology, make this the most comprehensive academic option to update your knowledge in Biomaterials and Artificial Tissues.

Get up to date with the different types of metallic, ceramic, synthetic and natural polymeric biomaterials used in cutting-edge biomedicine"

Advances in biomedicine itself are as important as in the materials used in a multitude of medical operations and interventions. Over the years, many of the implants and tissues used have been perfected, even incorporating cutting-edge technologies such as nanomaterials or shape memory.

This has led many engineers to dedicate their field of expertise to the study, development and research of these constantly evolving materials. For this reason, TECH has created this university program, in which leading engineers have contributed their theoretical and practical knowledge of the latest biomaterials.

As such, the engineering professional will review issues such as the properties and current challenges presented by the different types of biomaterials, as well as the multiple applications for each one of them.

The Postgraduate Certificate has TECH's quality guarantee, which is 100% online in a format that respects the engineer's personal and professional life. All the educational material is accessible from the beginning of the program and can be downloaded and studied from any device with an Internet connection.

This **Postgraduate Certificate in Biomaterials and Tissues in Biomedical Engineering** contains the most complete and up-to-date educational program on the market. Its most notable features are:

- Case studies presented by experts in Biomedical Engineering
- 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

Get up to speed with specific applications of biomedical micromachines, featuring artificial microneedles and contractile microactuators"

Delve into the research topics that attract the most attention in Biomedical Engineering, analyzing the applications of advanced nanomaterials and hydrogels of different types"

You have the freedom to decide how to take on the course workload. You will be able to download all the teaching material and study it even offline, at your own pace.

You will have the support of a technical and teaching staff that will be ready to solve all the doubts and complications that may arise throughout the program.

The program's teaching staff includes professionals from 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

Since the issue of biomaterials is one of special urgency within Biomedicine, the objective of this program could not be other than to provide the best material for research, study and practice on the subject. Thanks to the TECH methodology, engineers will see their knowledge of biomaterials gradually updated, even before the end of the program.

You will meet your most ambitious career goals thanks to TECH's tireless effort to provide you with the most relevant academic materials for your career path"

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

Specific Objectives

- 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

TECH puts at your disposal the most effective educational technology to make your professional development in the field of Biomaterials engineering as effective as

03

Course Management

This university program is created and directed by a group of professional engineers with extensive experience in various fields of Biomedicine, including international actions for highly prestigious multinationals. This gives an especially useful practical aspect to the teaching, since the engineer will not only obtain the most advanced theory but also the knowledge used in the day to day of the most pioneering biomaterials engineering.

You will be able to contact directly the faculty of the program, who will guide you at all times throughout the Postgraduate Certificate"

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

Mr. 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 Pontificia de Comillas University 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

Ms. Vivas Hernando, Alicia

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

04

Structure and Content

The structure and contents of this university program have been created following TECH's strictest parameters and criteria, and all programs are based on the most successful educational methodology, Relearning. In this way, engineers are able to update their knowledge of Biomaterials and Artificial Tissues in a progressive way, without having to make an immense effort to study all the extensive material provided.

You will have a wealth of complementary readings, practical exercises and detailed videos at your disposal, created by the teachers of the subject themselves"

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. Foreign Body Reaction (FBR)
- 1.5.2. In Vivo Behavior of Biomaterials
- 1.5.3. Biodegradation of Polymers Hydrolysis
  - 1.5.3.1. Biodegradation Mechanisms
  - 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: Smart 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 Imaging
  - 1.8.2.2. Coatings
  - 1.8.2.3. Focused Ligands
  - 1.8.2.4. Stimulus-Sensitive Connections
  - 1.8.2.5. Biomarkers

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 Microswimmers
- 1.10.2. Contractile Microactuators
- 1.10.3. Small Scale Handling
- 1.10.4. Biological Machines

Delve into the main novelties presented by Neuroengineering Applied to Materials, obtaining a new practical and scientific approach"

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.

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"

Case Study to contextualize all content

Our program offers a revolutionary method of skills and knowledge development. Our goal is to strengthen skills in a changing, competitive, and highly demanding environment.

At TECH, you will experience a way of learning that is shaking the foundations of traditional universities around the world."

You will have access to a learning system based on repetition, with natural and progressive teaching throughout the entire syllabus.

The student will learn to solve complex situations in real business environments through collaborative activities and real cases.

A learning method that is different and innova-

This TECH program is an intensive educational program, created from scratch, which presents the most demanding challenges and decisions in this field, both nationally and internationally. This methodology promotes personal and professional growth, representing a significant step towards success. The case method, a technique that lays the foundation for this content, ensures that the most current economic, social and professional reality is taken into account.

> *Our program prepares you to face new challenges in uncertain environments and achieve success in your career"*

The case method is the most widely used learning system in the best faculties in the world. The case method was developed in 1912 so that law students would not only learn the law based on theoretical content. It consisted of presenting students with real-life, complex situations for them to make informed decisions and value judgments on how to resolve them. In 1924, Harvard adopted it as a standard teaching method.

What should a professional do in a given situation? This is the question that you are presented with in the case method, an action-oriented learning method. Throughout the program, the studies will be presented with multiple real cases. They will have to combine all their knowledge and research, and argue and defend their ideas and decisions.

Relearning Methodology

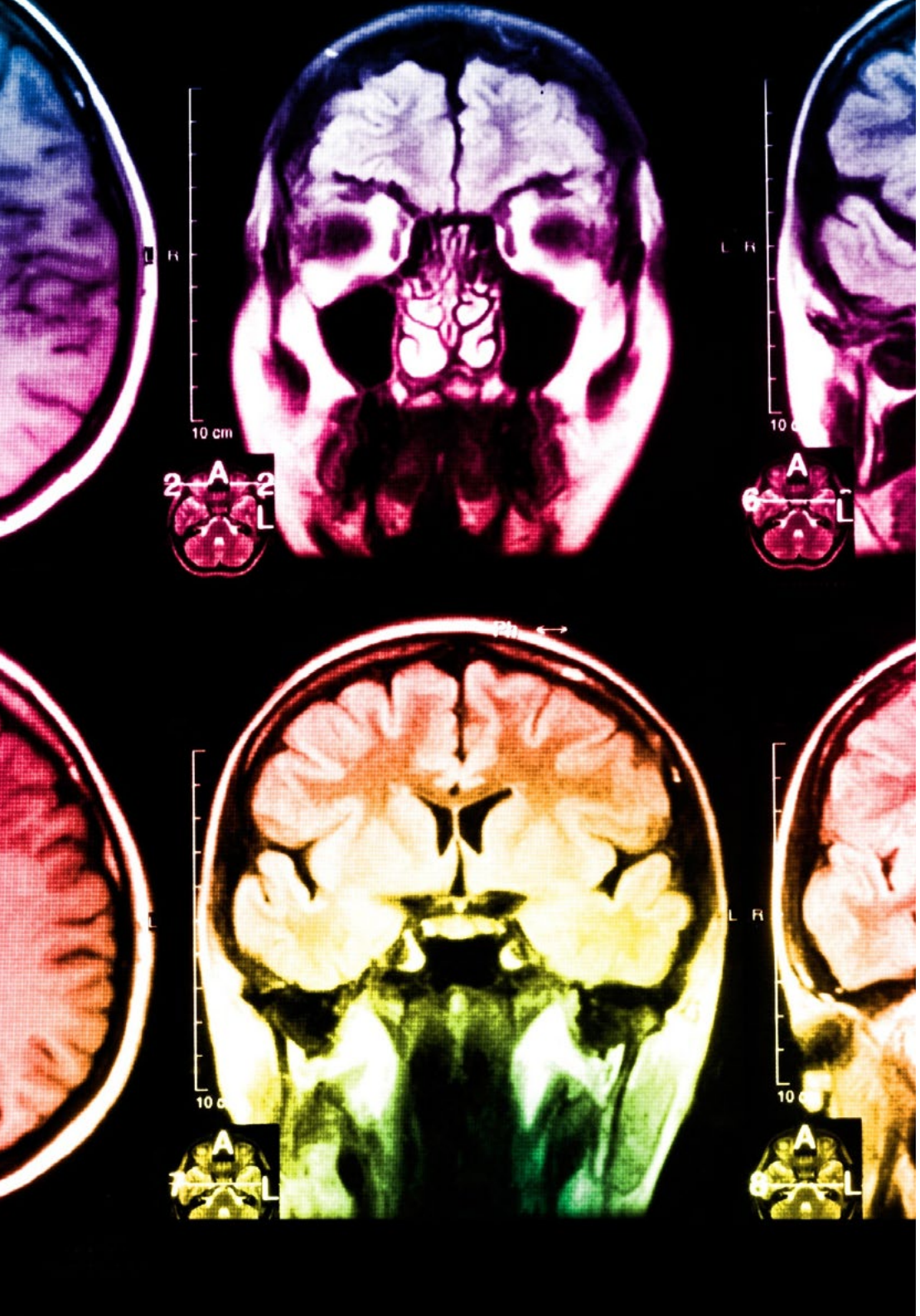
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines 8 different teaching elements in each lesson.

We enhance the Case Study with the best 100% online teaching method: Relearning.

In 2019, we obtained the best learning results of all online universities in the world.

At TECH, you will learn using a cutting-edge methodology designed to train the executives of the future. This method, at the forefront of international teaching, is called Relearning.

Our university is the only one in the world authorized to employ this successful method. In 2019, we managed to improve our students' overall satisfaction levels (teaching quality, quality of materials, course structure, objectives...) based on the best online university indicators.



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. This methodology has trained more than 650,000 university graduates with unprecedented success in fields as diverse as biochemistry, genetics, surgery, international law, management skills, sports science, philosophy, law, engineering, journalism, history, and financial markets and instruments. All this in a highly demanding environment, where the students have a strong socio-economic profile and an average age of 43.5 years.

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.

From the latest scientific evidence in the field of neuroscience, not only do we know how to organize information, ideas, images and memories, but we know that the place and context where we have learned something is fundamental for us to be able to remember it and store it in the hippocampus, to retain it in our long-term memory.

In this way, and in what is called neurocognitive context-dependent e-learning, the different elements in our program are connected to the context where the individual carries out their professional activity.

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 adapted in 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.

Classes

There is scientific evidence suggesting that observing third-party experts can be useful.

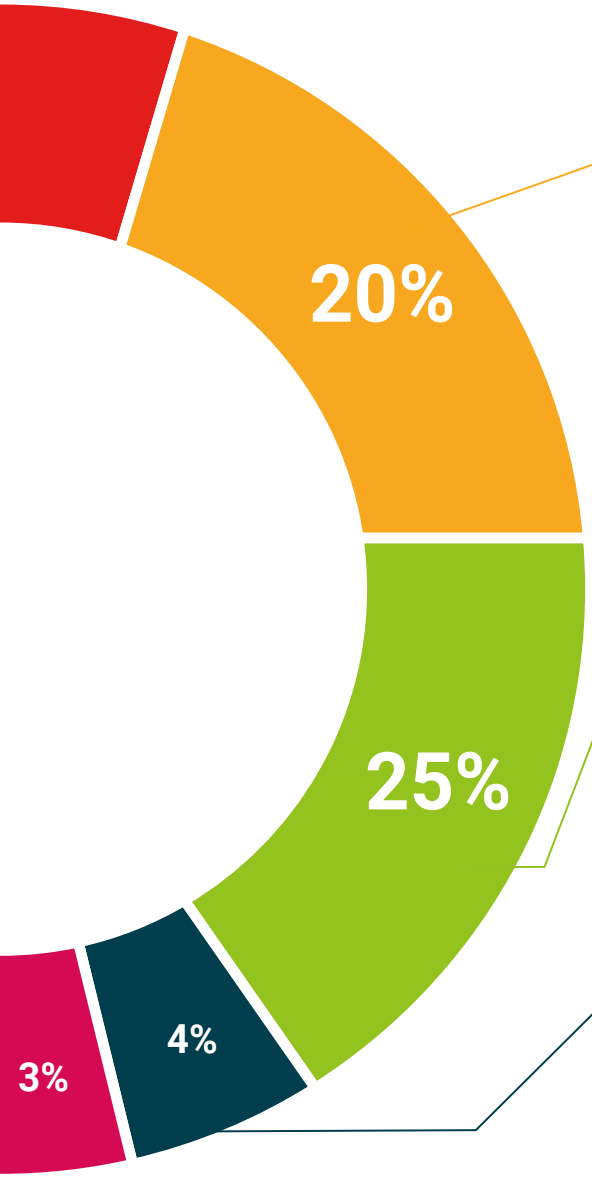
Learning from an Expert strengthens knowledge and memory, and generates

Practising Skills and Abilities

They will carry out activities to develop specific competencies and skills in each thematic area. Exercises and activities to acquire and develop the skills and abilities that a specialist needs to develop in the context of the globalization that we are experiencing.

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.



Case Studies

Students will complete a selection of the best case studies chosen specifically for this program. Cases that are presented, analyzed, and supervised by the best specialists in the world.

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

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.

06

Certificate

The Postgraduate Certificate in Artificial Biomaterials and Tissues in Biomedical Engineering guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate issued by TECH Technological University.

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

This **Postgraduate Certificate in Artificial Biomaterials and Tissues in Biomedical Engineering** contains the most complete and up-to-date program on the market.

After the student has passed the assessments, they will receive their corresponding **Postgraduate Certificate** issued by **TECH Technological University** via tracked delivery.

The diploma issued by **TECH Technological University** will reflect the qualification obtained in the Postgraduate Certificate, and meets the requirements commonly demanded by labor exchanges, competitive examinations and professional career evaluation committees.

Title: **Certificate in Artificial Biomaterials and Tissues in Biomedical Engineering**

Official Nº of Hours: **150 hours.**


tech universidad tecnológica

Otorga la presente

CONSTANCIA

a

C. _____, con documento de identificación nº_____

Por haber superado con éxito y acreditado el programa de

DIPLOMADO

en

Biomateriales y Tejidos Artificiales en Ingeniería Biomédica

Se trata de un título propio de esta Universidad con una duración de 150 horas, con fecha de inicio dd/mm/aaaa y fecha de finalización dd/mm/aaaa.

TECH es una Institución Particular de Educación Superior reconocida por la Secretaría de Educación Pública a partir del 28 de junio de 2018.

A 17 de junio de 2020

Mtra.Tere Guevara Navarro
Rectora

Este título propio se deberá acompañar siempre del título universitario habilitante expedido por la autoridad competente para ejercer profesionalmente en cada país. código único TECH: AFWOR23S techtitute.com/titulos

*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.

tech technological university

Postgraduate Certificate

Artificial Biomaterials and Tissues in Biomedical Engineering

Course Modality: **Online**

Duration: **6 weeks**

Certificate: **TECH Technological University**

Teaching Hours: **150 hours.**

Postgraduate Certificate

Artificial Biomaterials and Tissues in Biomedical Engineering

tech technological university