

Postgraduate Certificate
Biomaterials and Artificial
Tissues in Biomedical
Engineering





Postgraduate Certificate Biomaterials and Artificial Tissues in Biomedical Engineering

Course Modality: Online

Duration: 6 weeks

Certificate: TECH Technological University

6 ECTS Credits

Teaching Hours: 150 hours

Website: 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”

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.

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



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

- ◆ 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

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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

- ♦ 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



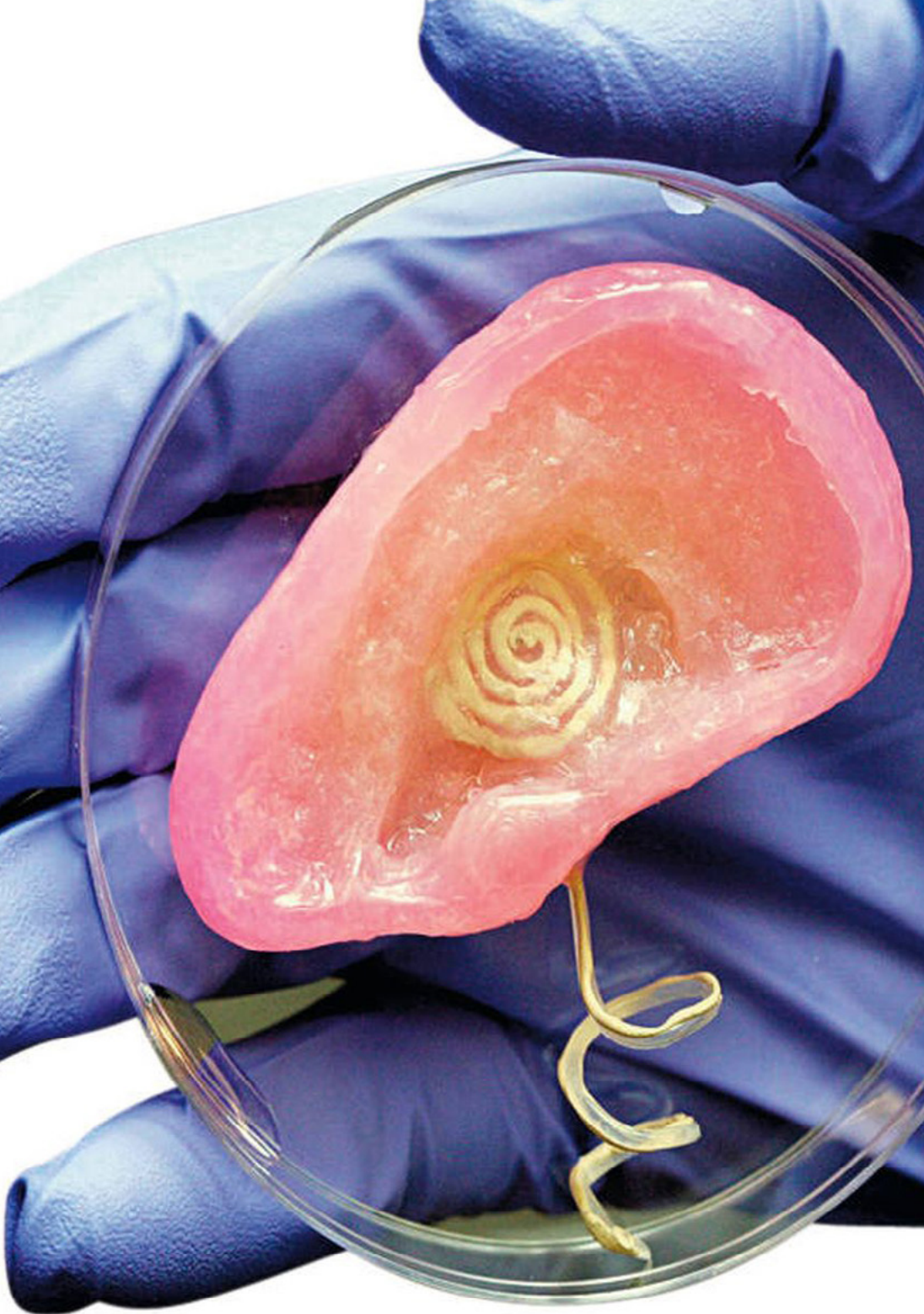
Thanks to TECH, you will be able to learn with the best professionals in the world"

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



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

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.



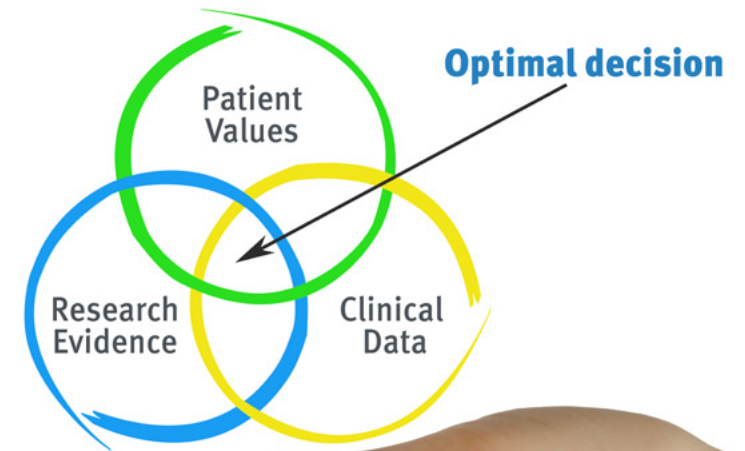
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Discover Re-learning, a system that abandons conventional linear learning, to take you through cyclical teaching systems: a way of learning that has proven to be extremely effective, especially in subjects that require memorization".

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. Gervas, 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.

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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. 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

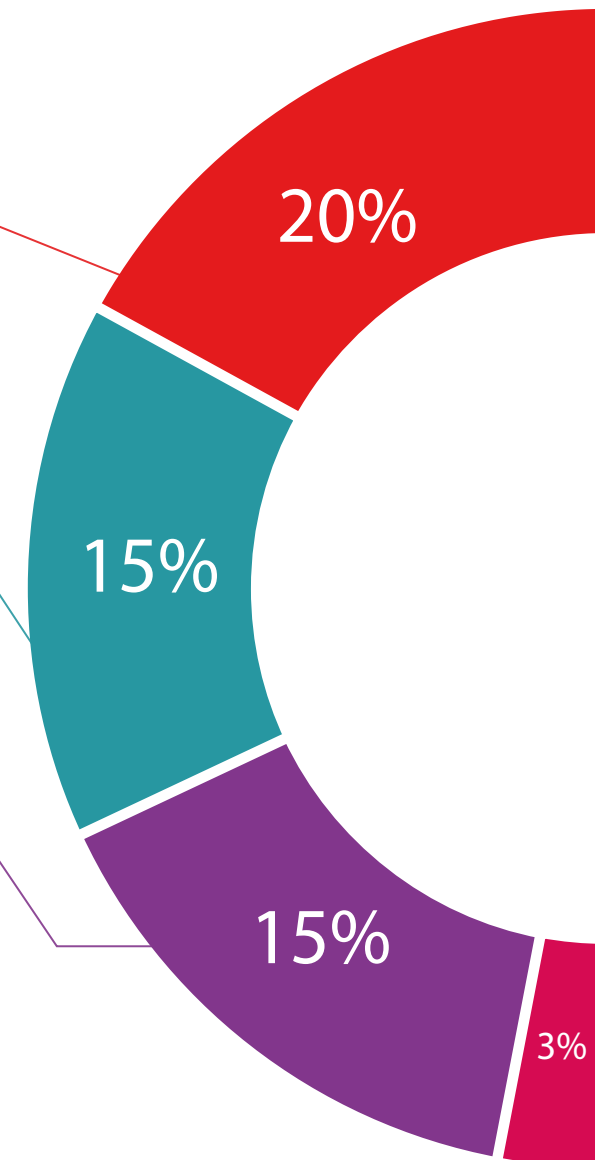
The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

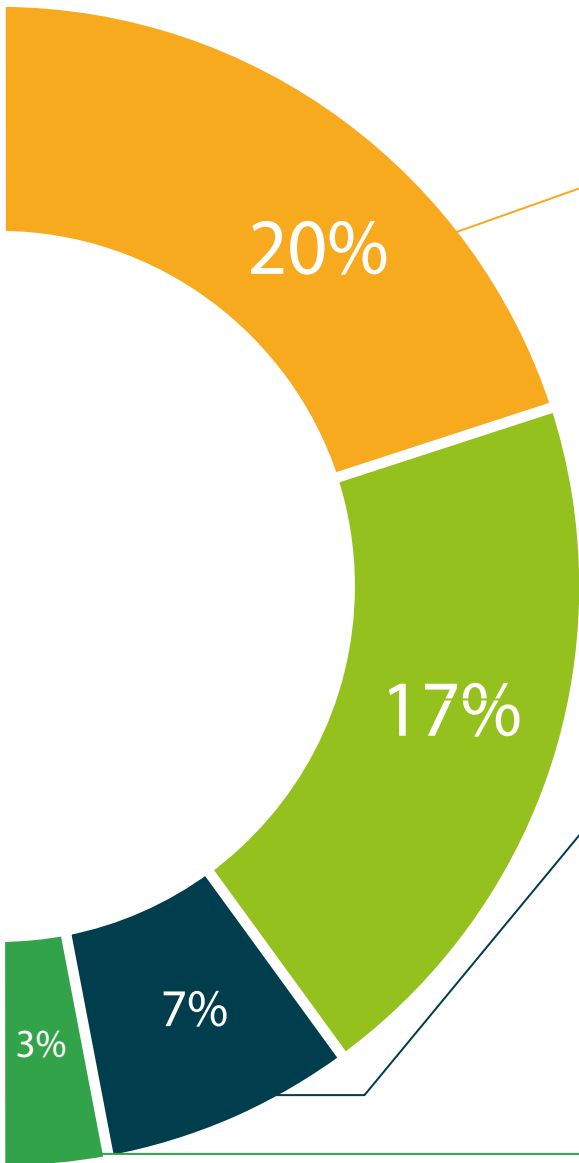
This exclusive multimedia content presentation training Exclusive system was awarded by Microsoft as a "European Success Story".



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 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 Technological University.



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

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

ECTS: 6

No. of Official Hours: 150 hours



*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.

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



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Course Modality: Online

Duration: 6 weeks

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