

Postgraduate Certificate

Design and Creation of Human-Machine Interface in Biomedical Engineering





Postgraduate Certificate

Design and Creation of Human-Machine Interface 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/design-creation-human-medicine-interface-biomedical-engineering

Index

01

Introduction

p. 4

02

Objectives

p. 8

03

Course Management

p. 12

04

Structure and Content

p. 16

05

Methodology

p. 20

06

Certificate

p. 28

01

Introduction

To ensure the success of a given software or application, it is important to develop an intuitive and attractive interface that meets the user's needs, in this case, in the medical field. The objective of this qualification is to introduce the specialist to the multiple possibilities that arise around the different typologies of interfaces and their adaptation to each context. Thanks to its 100% online methodology, the graduate will have all the necessary academic tools that will allow them to develop a critical capacity for the design of interfaces in the medical sector.



“

*You will further your understanding of UX/
UI tools in the design process and expand
your knowledge in the development of the
human-machine interaction concept”*

Numerous studies have shown that the quality of the interface design of any application or software has a significant impact on its results, since having a program based on a good user experience can help the specialist by facilitating its use and allowing him to achieve the objectives for which it was designed more quickly and with better results.

In the field of biomedical technology, where advances are made on a daily basis, it is important that there is collaboration and communication between engineers and physicians in order to increase productivity in both the design and creation processes, as well as in information gathering once they are underway. This is why there is a need among healthcare professionals to find a degree that introduces them to this field and allows them to acquire all the information they need to increase their knowledge in this field.

In response to this demand TECH launches the Postgraduate Certificate in Design and Creation of Human-Machine Interface in Biomedical Engineering, in which the specialist will work from the interface and human-machine interaction to the design process based on prototyping and evaluation. In addition, this program places special emphasis on the interaction methods of current technologies and the importance of graphic design as a key to success.

150 hours of content including additional audiovisual material, summaries of each unit, case studies and complementary readings, all in the characteristic online format that defines TECH. In addition, during the academic process, the specialist will be able to consult with the teaching staff for any doubts or questions that may arise during the course.

This **Postgraduate Certificate in Design and Creation of Human-Machine Interface 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 100% online degree where you decide.
We provide you with all the content and
the best tools, but you set the pace"*

“ *An opportunity to access the best program from the best experts and with the guarantee offered by a university with years of experience in online teaching of the highest quality*”

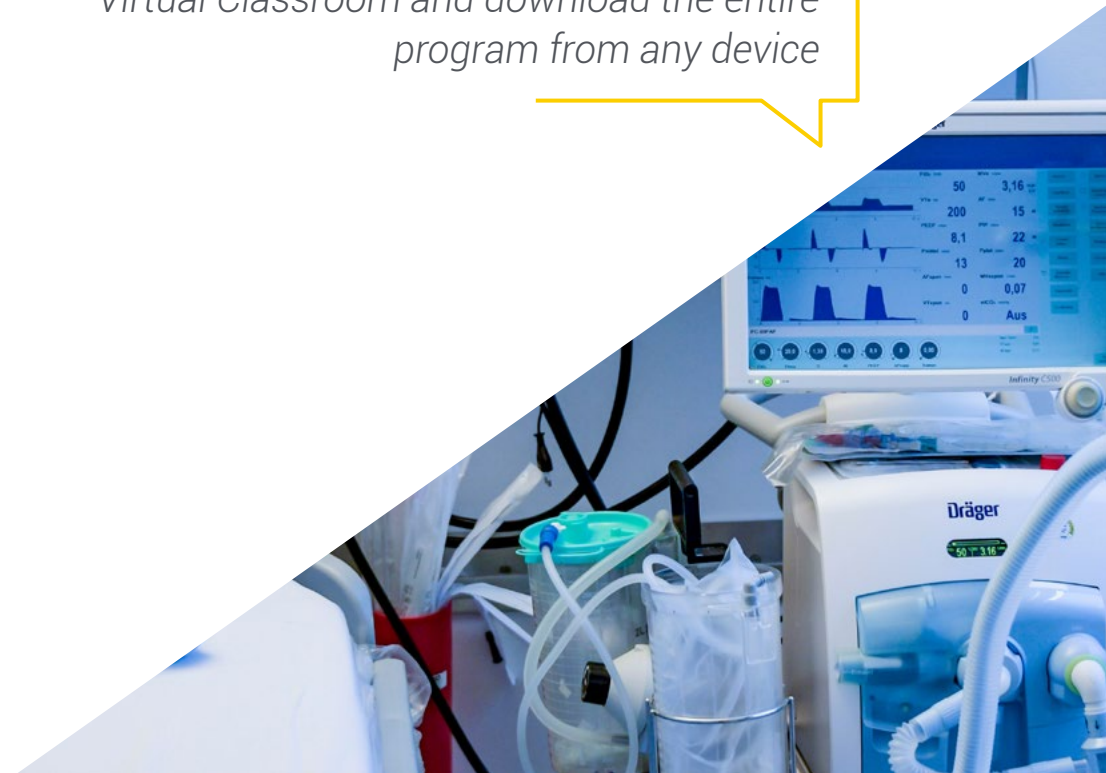
The program's teaching staff includes professionals from the sector who contribute their work experience to this training program, as well as renowned specialists from leading societies and prestigious universities.

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.

Enter the world of prototyping and interface evaluation and delve into the techniques of organizing ideas and the importance of User Experience (UX)

You will have all the contents from day one. In addition, you will be able to access the Virtual Classroom and download the entire program from any device



02 Objectives

Although it may seem that the subject of this Postgraduate Certificate is more geared towards engineering rather than medicine, the objective of TECH is for the medical specialist to understand the necessary concepts that will allow them to develop and actively participate in the process of designing and creating biomedical interfaces. In this way, the result will be more promising and productive as you will be able to provide your own user experience and improve the software or applications you are working on.



“

A 100% online degree that aims to have a positive impact on the professional career of the specialist, providing them with the necessary concepts that will allow them to develop in the world of design and creation of biomedical interfaces”



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

- Develop the concept of human-machine interaction
- Analyze interface typologies and their adaptation to each context
- Identify the human and technological factors involved in the interaction process
- Examine design theory and its application to interface design
- Deepen UX/UI tools in the design process
- Establish methods for evaluating and validating interfaces
- Training in the use of user-centered methodology and *Design Thinking* methodology
- Further study of new technologies and interfaces in the biomedical sector
- Address the importance of user perception in the in-hospital context
- Develop critical interface design skills

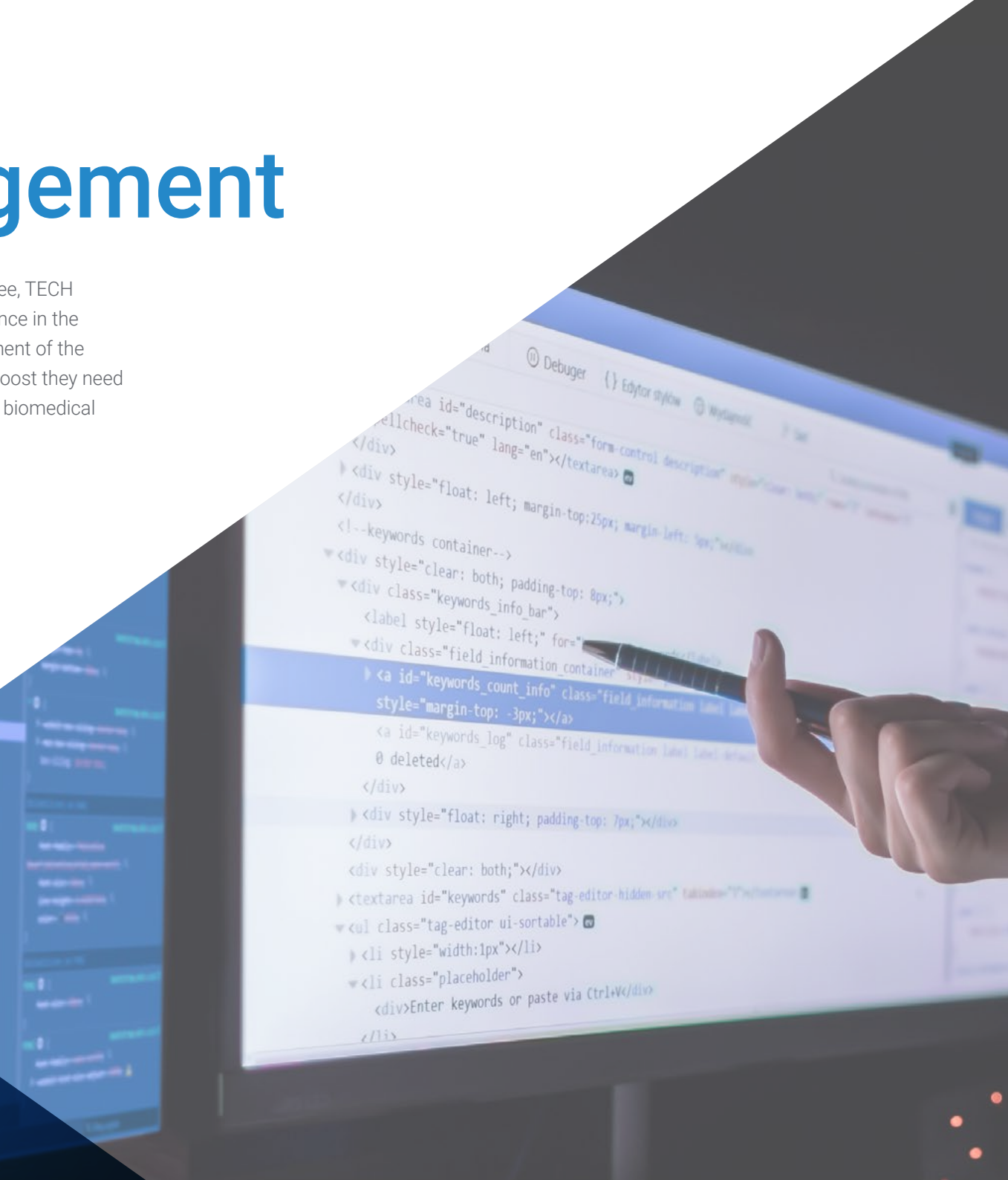


The more demanding your objectives are, the more you will be able to get out of this Postgraduate Certificate"

03

Course Management

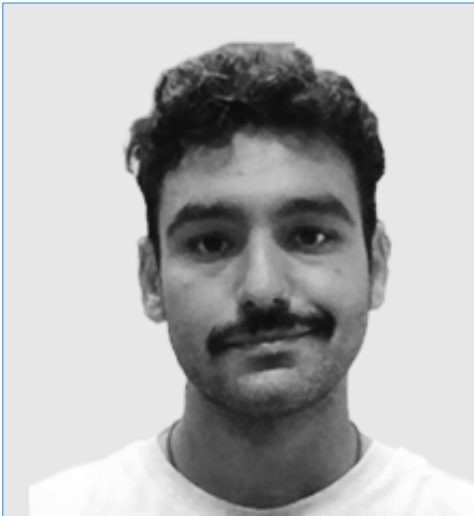
For the formation of the management and teaching staff of this degree, TECH has selected a group of specialists in the field, with extensive experience in the sector and committed to the professional and professional improvement of the graduate. Having a team like this will give the specialist's career the boost they need to become experts in the design and creation of interfaces applied to biomedical engineering.



“

The teaching team will be available to guide you to achieve all the goals you set for yourself with the Postgraduate Certificate of this course”

Management



Dr. 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

Baselga Lahoz, Marta

- ◆ R&D Engineer and Technical Engineer in the automotive sector.
- ◆ Design Engineer (UX/UI) in the web development and graphic design sector (Madrid, Spain).
- ◆ Graduated in Industrial Design Engineering and Product Development from the University of Zaragoza (Zaragoza, Spain).
- ◆ Professional Master's Degree in Biomedical Engineering from the International University of Valencia (Valencia, Spain).
- ◆ Professional Master's Degree in Design and Management of Technological Projects from the International University of La Rioja (La Rioja, Spain).
- ◆ D. candidate in Biomedical Engineering at the University of Zaragoza (Zaragoza, Spain).
- ◆ Doctor of Medicine, University of Zaragoza (Zaragoza, Spain).
- ◆ Postgraduate Diploma in Diagnostic Techniques in Health Sciences, Universidad San Jorge (Zaragoza, Spain).

04

Structure and Content

Following TECH's pedagogical line, this Postgraduate Certificate has been designed following the criteria of the teaching team and based on the most modern and effective educational methodology. In addition, thanks to the tools available at this university, the graduate will find in this and in all TECH courses an academic experience of the highest quality, which guarantees the best results and with which the specialist will feel satisfied since the progress is visible from the first day.





“

You will have additional content of the highest quality: videos, images, dynamic summaries, real case studies and much more!”

Module 1. Human-Machine Interface Applied to Biomedical Engineering

- 1.1. Human-Machine Interface
 - 1.1.1. Human-Machine Interface
 - 1.1.2. Model, System, User, Interface and Interaction
 - 1.1.3. Interface, Interaction and Experience
- 1.2. Human-Machine Interaction
 - 1.2.1. Human-Machine Interaction
 - 1.2.2. Principles and Laws of Interaction Design
 - 1.2.3. Human Factors
 - 1.2.3.1. Importance of the Human Factor in the Interaction Process
 - 1.2.3.2. Psychological-Cognitive Perspective: Information Processing, Cognitive Architecture, User Perception, Memory, Cognitive Ergonomics and Mental Models
 - 1.2.4. Technological factors
 - 1.2.5. Basis of Interaction: Levels and Styles of Interaction
 - 1.2.6. At the Forefront of Interaction
- 1.3. Interface Design (I): Design Process
 - 1.3.1. Design Process
 - 1.3.2. Value Proposition and Differentiation
 - 1.3.3. Requirements Analysis and Briefing
 - 1.3.4. Collection, Analysis and Interpretation of Information
 - 1.3.5. The Importance of UX and UI in the Design Process
- 1.4. Interface Design (II): Prototyping and Evaluation
 - 1.4.1. Prototyping and Evaluation of Interfaces
 - 1.4.2. Methods for the Conceptual Design Process
 - 1.4.3. Techniques for Idea Organization
 - 1.4.4. Prototyping Tools and Process
 - 1.4.5. Evaluation Methods
 - 1.4.6. Evaluation Methods With Users: Interaction Diagrams, Modular Design, Heuristic Evaluation
 - 1.4.7. Evaluation Methods Without Users: Surveys and Interviews, *Card Sorting*, A/B Testing and Design of Experiments
 - 1.4.8. Applicable ISO Norms and Standards
- 1.5. User Interfaces (I): Interaction Methods in Current Technologies
 - 1.5.1. User Interface (UI)
 - 1.5.2. Classical User Interfaces: Graphical User Interfaces (GUIs), Web, Touch, Voice, etc.
 - 1.5.3. Human Interfaces and Limitations: Visual, Hearing, Motor and Cognitive Diversity
 - 1.5.4. Innovative User Interfaces: Virtual Reality, Augmented Reality, Collaborative
- 1.6. User Interfaces (II): Interaction Design
 - 1.6.1. The Importance of Graphic Design
 - 1.6.2. Design Theory
 - 1.6.3. Design Rules: Morphological Elements, *Wireframes*, Use and Theory of Color, Graphic Design Techniques, Iconography, Typography
 - 1.6.4. Semiotics Applied to Interfaces
- 1.7. User Experience (I): Methodologies and Design Fundamentals
 - 1.7.1. User Experience(UX)
 - 1.7.2. Evolution of Usability Effort-to-Benefit Ratio
 - 1.7.3. Perception, Cognition and Communication
 - 1.7.3.1. Mental Models
 - 1.7.4. User Focused Design Methodology
 - 1.7.5. Methodology of *Design Thinking*
- 1.8. User Experience (II): Principles of User Experience
 - 1.8.1. UX Principles
 - 1.8.2. UX Hierarchy: Strategy, Scope, Structure, Skeleton and Visual Component
 - 1.8.3. Usability and Accessibility
 - 1.8.4. Information Architecture: Classification, Labeling, Navigation, and Search Systems
 - 1.8.5. *Asequibles y Significantes*
 - 1.8.6. Heuristics: Heuristics of Understanding, Interaction and Feedback
- 1.9. Interfaces in the Field of Biomedicine (I): the Interaction of the Health Care Worker
 - 1.9.1. Usability in the Intrahospital Context
 - 1.9.2. Interaction Processes in Healthcare Technology



- 1.9.3. Health Care Provider and Patient Perception
- 1.9.4. Healthcare Ecosystem: Primary Care Physician Vs. Operating Room Surgeon
- 1.9.5. Interaction of the Healthcare Worker in a Context of Stress
 - 1.9.5.1. ICU Cases
 - 1.9.5.2. The Case of Extreme Circumstances and Emergencies
 - 1.9.5.3. The Case of the Operating Rooms
- 1.9.6. *Open Innovation*
- 1.9.7. Persuasive Design
- 1.10. Interfaces in the Field of Biomedicine (II): Current Outlook and Future Trends
 - 1.10.1. Classical Biomedical Interfaces in Healthcare Technologies
 - 1.10.2. Innovative Biomedical Interfaces in Healthcare Technologies
 - 1.10.3. The role of Nanomedicine
 - 1.10.4. Biochips
 - 1.10.5. Electronic Implants
 - 1.10.6. Brain-Computer Interfaces (BCI)



If you have long wanted to direct your career towards the world of interface design in biomedicine, this is your opportunity and TECH is the best option to achieve your goals"

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 Design and Creation of Human-Machine Interface in Biomedical Engineering guarantees you, in addition to the most rigorous and updated training, access to a Postgraduate Certificate issued by TECH Technological University.





“

Successfully complete this specialisation and receive your university degree without travel or laborious paperwork”

This **Postgraduate Certificate in Design and Creation of Human-Machine Interface in Biomedical Engineering** is the most comprehensive and up-to-date 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 Design and Creation of Human-Machine Interface in Biomedical Engineering**

ECTS: **6**

Official N° of Hours: **150 hours**



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



Postgraduate Certificate
Design and Creation of
Human-Machine Interface
in Biomedical Engineering

Course Modality: Online

Duration: 6 weeks

Certificate: TECH Technological University

6 ECTS Credits

Teaching Hours: 150 hours

Postgraduate Certificate

Design and Creation of Human-
Machine Interface in Biomedical
Engineering