Postgraduate Certificate

Design and Creation of Human-Machine Interfaces in Biomedical Engineering

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Postgraduate Certificate

Design and Creation of Human-Machine Interfaces in Biomedical Engineering

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

Website: **www.techtitute.com/us/engineering/postgraduate-certificate/design-creation-human-machine-interfaces-biomedical-engineering**

Index

01

Introduction

The design and improvement of interfaces has been a major subject of discussion in computer science for years. So much so, that user experience, or UX, has become a discipline in the design of all types of apps, websites and devices. When transferring this to Biomedical Engineering, it is essential for the engineer to know and keep up to date on the specific requirements of this subject. For this reason, TECH has created this comprehensive university program, in which renowned professionals have poured all their knowledge and personal experience to provide a comprehensive and quality update.

Access the most up-to-date content on usability and interfaces in the in-hospital context, as well as the different interaction processes in state-of-the-art healthcare technology"

When designing and creating different types of machinery for medical use, it is essential that there is an intrinsic collaboration between engineers and practitioners in this work. Human-machine interfaces must not only be clear, but must also display and collect the right information.

Therefore, this Postgraduate Certificate emphasizes the human and technological factors to be taken into account in the different phases of design, prototyping and evaluation or the fundamental principles of user experience to be taken into account, among other topics of special interest to any engineer seeking a comprehensive yet concise update on the subject.

All this with TECH's characteristic 100% online format, which allows the professional to download all the educational material from the first day of the program. This means that there are neither in-person classes nor fixed schedules, giving you total freedom to adapt the workload to your own personal and professional responsibilities.

This **Postgraduate Certificate in Design and Creation of Human-Machine Interfaces 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 the self-assessment process can be carried out 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 date on future trends such as Nanomedicine, biochips, electronic implants or brain-computer interfaces"

You will have access to the most complete syllabus, ranging from interfaces in ICU or extreme circumstances to the different design rules specific to Biomedical Engineering"

You will not have to adapt to any schedule. You decide when, how and where to study.

You will have the support of the largest online academic institution in the world, TECH.

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

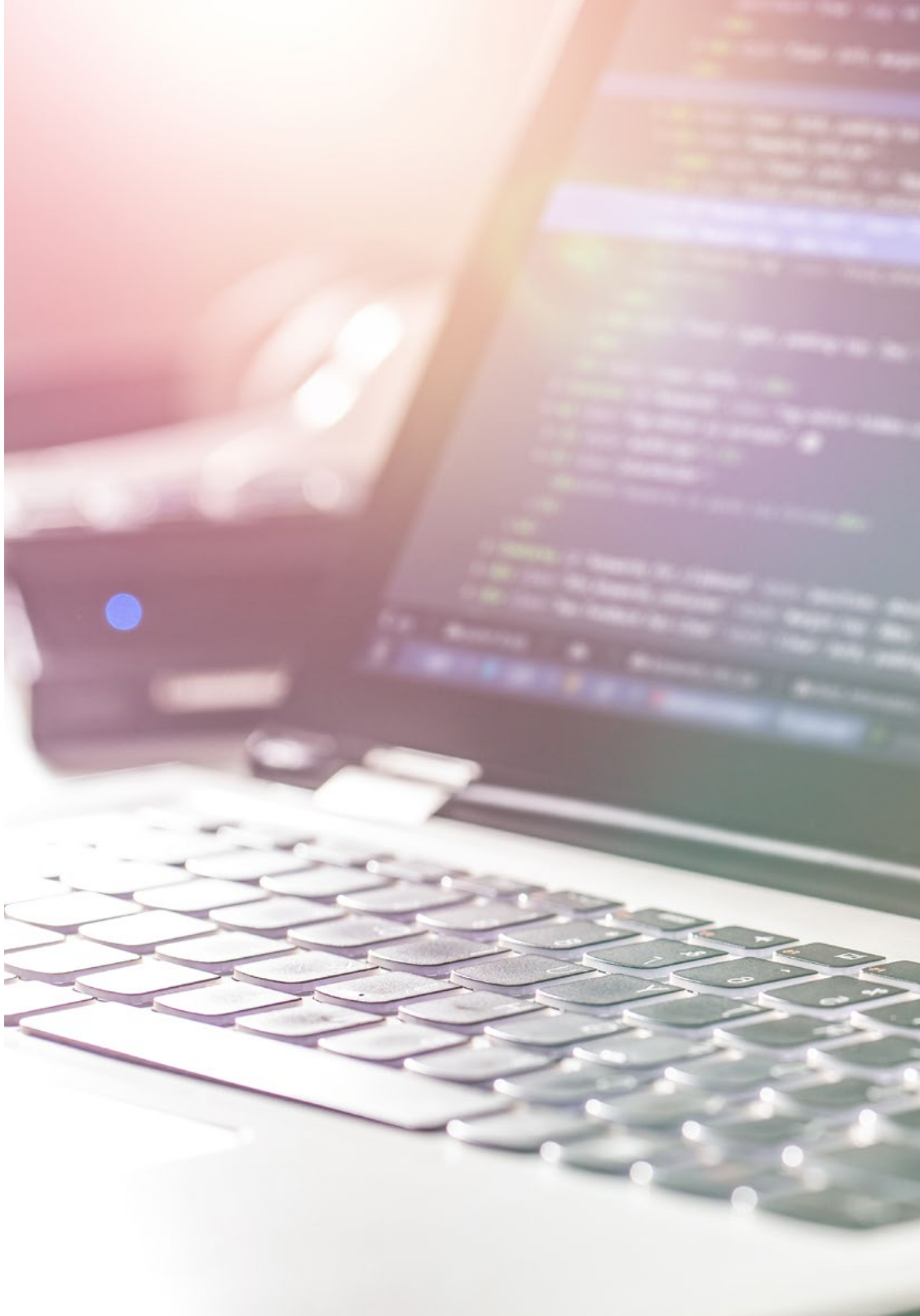
Objectives

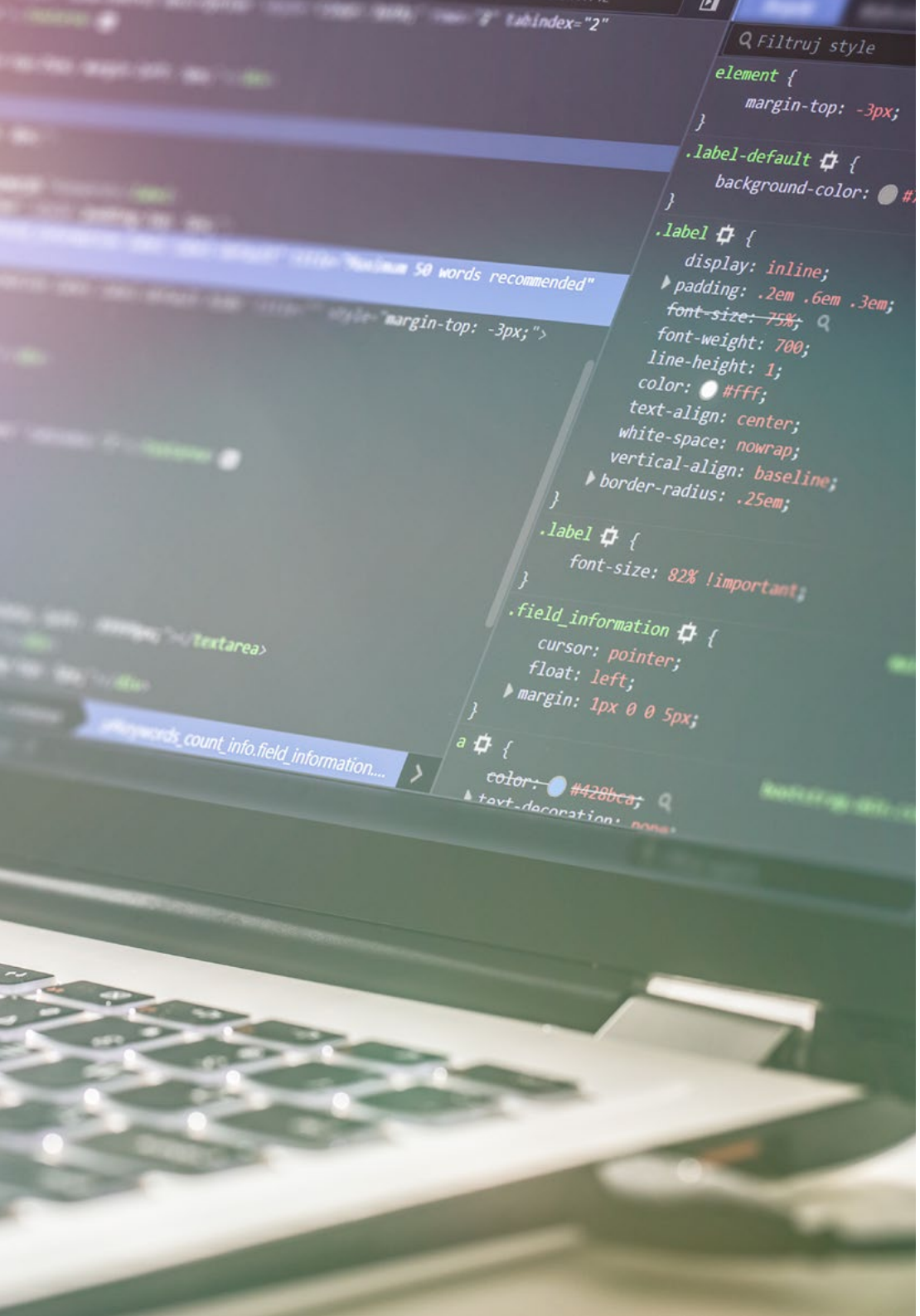
Taking into account that the user experience in medical terms is a matter that must be very precise and fine-tuned, TECH has provided this Postgraduate Certificate with the latest scientific postulates and the practical experience of its own teaching staff. This makes the program a perfect stepping stone for any engineer looking to catch up and maintain their high level of expertise.

All the educational material, including detailed videos, interactive summaries and exercises of all kinds will be key in your updating process"

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

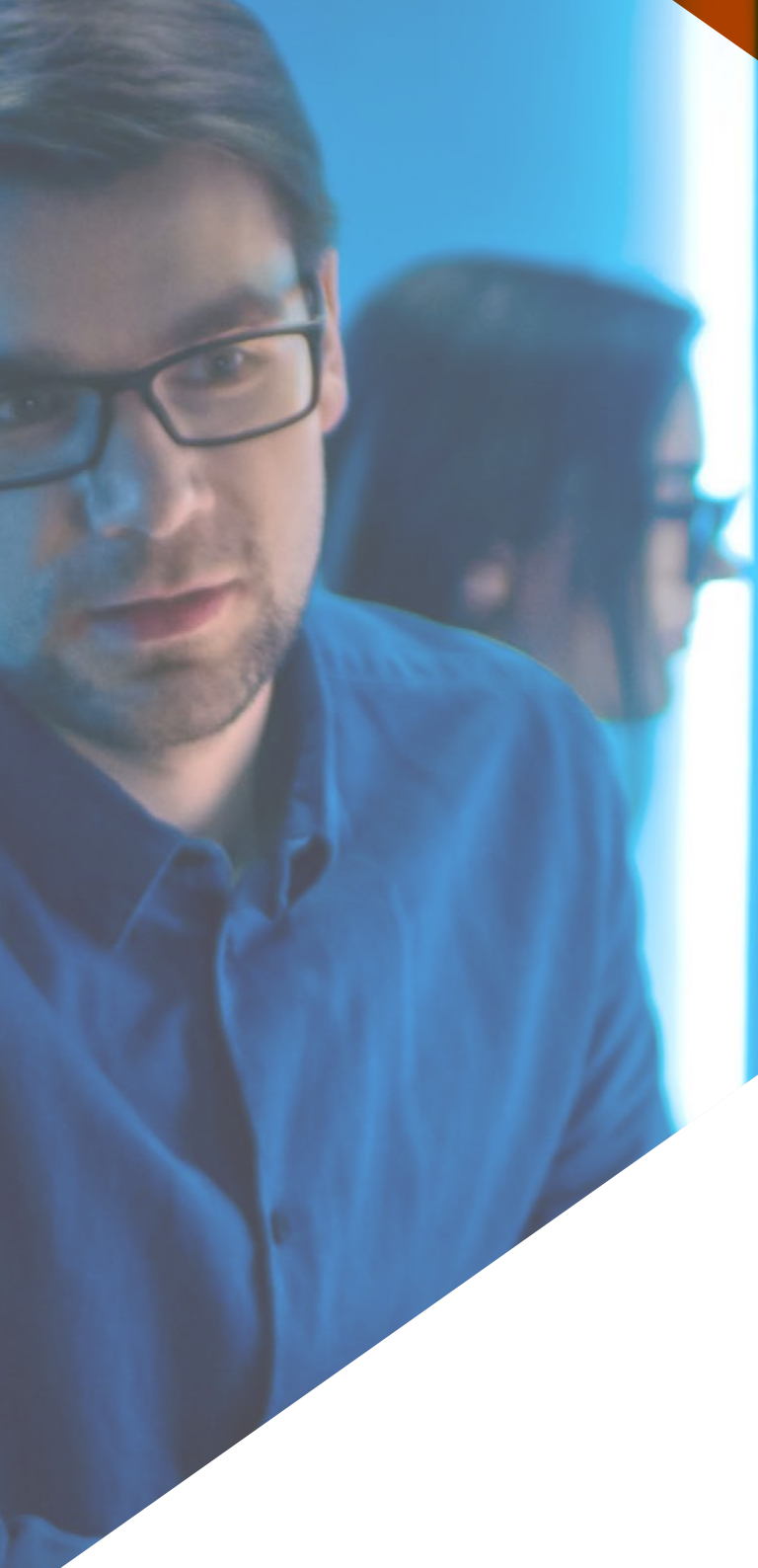
- Develop the concept of human-machine interaction
- Analyze interface typologies and their adaptation to each context
- Identify the human and technological factors involved in the interaction process
- Examine design theory and its application to interface design
- Acquire in-depth knowledge of UX/UI tools in the design process
- Establish methods for evaluating and validating interfaces
- Train 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

Give a boost of quality and depth to your professional profile thanks to this Postgraduate Certificate"

03

Course Management

TECH has entrusted the management of this Postgraduate Certificate to leading professionals in the field of Biomedical Engineering. This provides not only a high-quality syllabus, but also a practical view of the most useful methods and technology in today's world. The student will have at all times the support and advice of a teaching staff committed to the program.



All the educational and complementary material for this Postgraduate Certificate has been carefully selected by professionals who know your needs and requirements"

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. 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)
- PhD 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

In order to provide the engineer with the most up-to-date information, the contents and structure of this Postgraduate Certificate have been created to be clear and accessible. Units such as human-machine interface or interface design have been further divided into different sub-units. This facilitates both the organization of the teaching load and the subsequent consultation of all the downloaded material.

You will find a good amount of complementary reading for each unit, which will further reinforce your knowledge of each subject"

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. Principles of Interaction: Levels and Styles of Interaction
- 1.2.6. At the Forefront of Interaction

1.3. Interface Design (I): The 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. Interface Prototyping and Evaluation
- 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. User-Free Evaluation Methods: 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 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

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. The User Experience (II): User Experience Principles
- 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. Affordances & Signifiers
- 1.8.6. Heuristics: Heuristics of Understanding, Interaction and Feedback

1.9. Interfaces in the Field of Biomedicine (I): The Interaction of the Healthcare Worker
- 1.9.1. Usability in the Intrahospital Context
- 1.9.2. Interaction Processes in Healthcare Technology
- 1.9.3. Healthcare 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)

After finishing this TECH Postgraduate Certificate, you will have mastered the creation of interfaces in Biomedical Engineering"

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 approach to developing skills and knowledge. Our goal is to strengthen skills in a changing, competitive, and highly demanding environment.

At TECH, you will experience a learning methodology 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 innovative

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

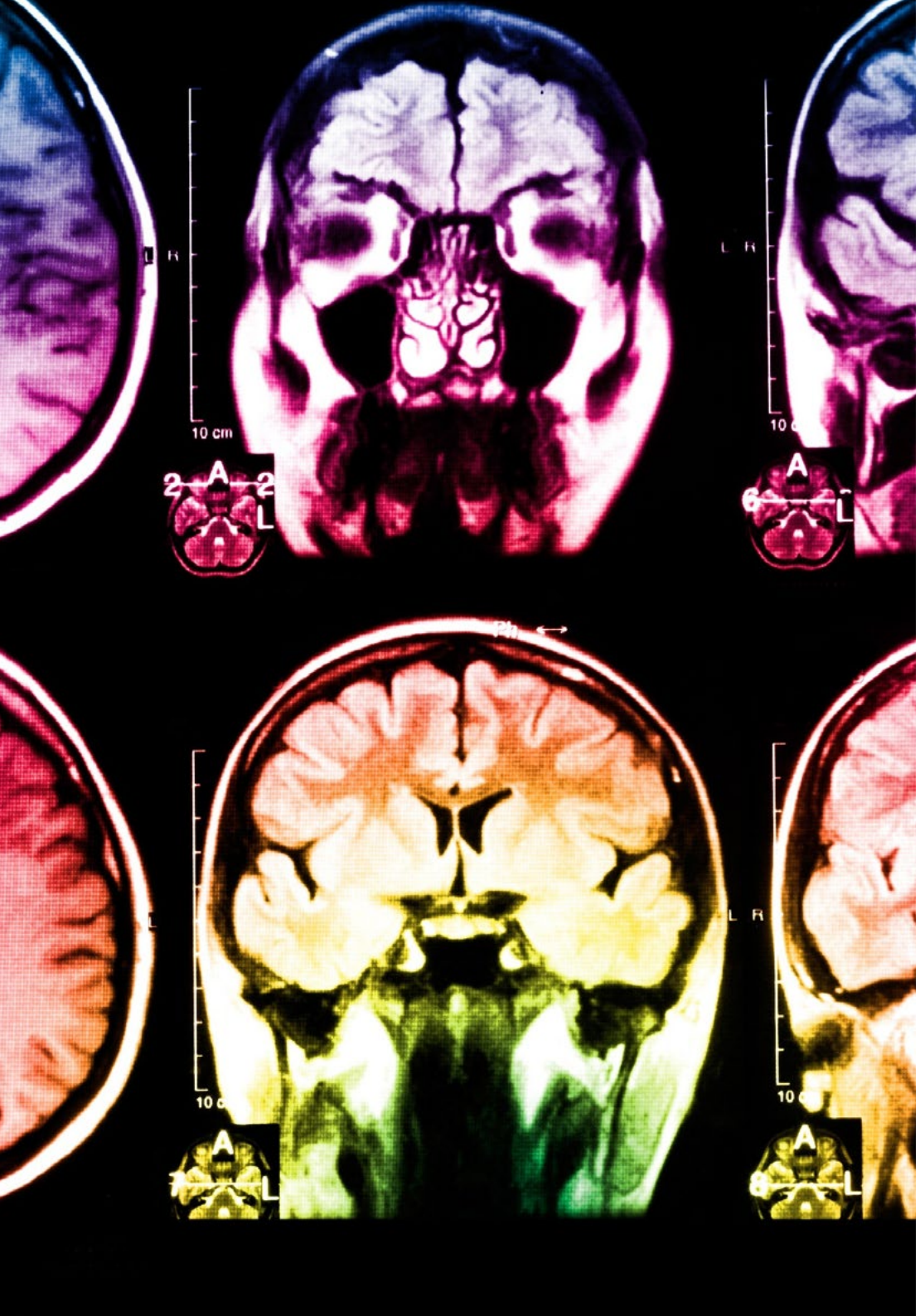
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines 8 different teaching elements in each lesson.

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 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.

Classes

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

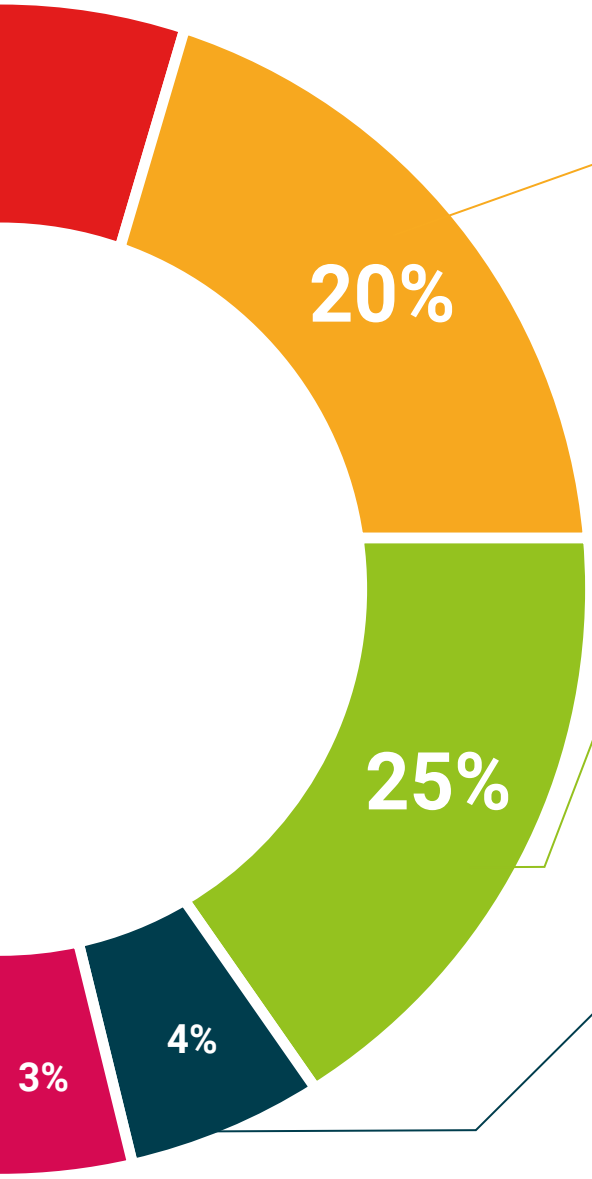
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

Practising Skills and Abilities

They will carry out activities to develop specific skills and abilities in each subject 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 Design and Creation of Human-Machine Interfaces in Biomedical Engineering guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate issued by TECH Global University.

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

This private qualification will allow you to obtain an **Postgraduate Certificate in Design and Creation of Human-Machine Interfaces 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.

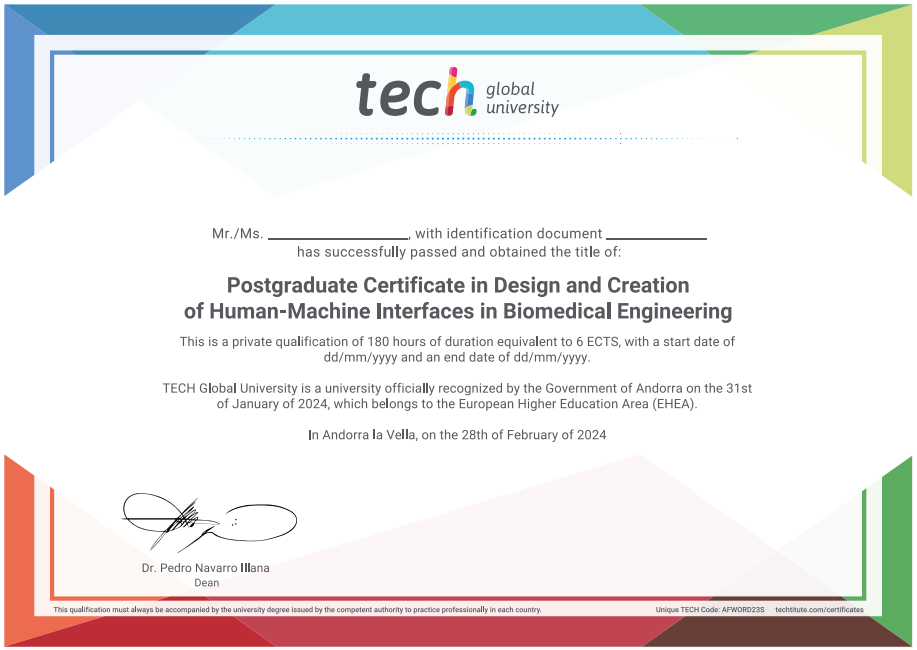
This **TECH Global University** private qualification, is a European program of continuing education and professional updating that guarantees the acquisition of competencies in its area of knowledge, providing a high curricular value to the student who completes the program.

Title: **Postgraduate Certificate in Design and Creation of Human-Machine Interfaces in Biomedical Engineering**

Modality: **online**

Duration: **6 weeks**

Accreditation: **6 ECTS**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Mr./Ms. _____, with identification document _____
has successfully passed and obtained the title of:

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

This is a private qualification of 180 hours of duration equivalent to 6 ECTS, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

TECH Global University is a university officially recognized by the Government of Andorra on the 31st of January of 2024, which belongs to the European Higher Education Area (EHEA).

In Andorra la Vella, on the 28th of February of 2024

Dr. Pedro Navarro Illana
Dean

This qualification must always be accompanied by the university degree issued by the competent authority to practice professionally in each country. Unique TECH Code: AFWORD23S techtitute.com/certificates

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

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- Exams: **online**

Postgraduate Certificate

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