

# Postgraduate Certificate Embedded Electronic Systems





## Postgraduate Certificate Embedded Electronic Systems

Course Modality: **Online**

Duration: **12 weeks**

Certificate: **TECH Technological University**

Teaching Hours: **300 h.**

Website: [www.techtute.com/in/engineering/postgraduate-certificate/embedded-electronic-systems](http://www.techtute.com/in/engineering/postgraduate-certificate/embedded-electronic-systems)

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# 01

# Introduction

Embedded Electronic Systems, also called integrated, are widely used today for applications that require real-time signal processing. Such devices can have a single processor or several processors working in a distributed manner and are common in devices used in everyday life. Therefore, continuous learning for engineers in this field is essential to keep up to date with the main developments in the industry. In this way, the accomplishment of this TECH program will help students to become true specialists in the field, capable of handling the most complex systems, thanks to which the day-to-day life of citizens can be facilitated.





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*Learn how to design and repair Embedded Electronic Systems and become the specialist that every company wants to have on staff”*

The Postgraduate Certificate in Embedded Electronic Systems of TECH develops the current software and hardware techniques that engineers must know to be able to solve electronic problems that require real-time signal processing. These are challenging tasks, which means that professionals in the sector are looking for ways to continually improve their knowledge in order to be able to work more safely and, above all, with greater guarantees of success. In this way, by improving their knowledge, they will also be improving the way they work, achieving greater recognition and the trust of their customers.

Specifically, the syllabus of this Postgraduate Certificate covers from embedded systems to microprocessors or real-time operating systems, but the program also highlights an important section on the design of electronic systems, focusing on portable devices (whether computers, cell phones, diagnostic tools, etc.). In this way, the casings of electronic devices are analyzed with an increasingly high level of integration, among other aspects.

A first-class academic 100% online program that will allow students to distribute their study time, not being conditioned by fixed schedules or the need to move to another physical location, being able to access all the contents at any time of the day, and therefore able to balance their work and personal life with their academic life. Without a doubt, the academic opportunity that engineers have been waiting for to improve their qualifications without leaving aside the rest of their daily duties.

This **Postgraduate Certificate in Embedded Electronic Systems** contains the most complete and up-to-date program on the market. The most important features include:

- ◆ Case studies presented by engineering experts
- ◆ 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
- ◆ Special emphasis on innovative methodologies in Embedded Electronic Systems
- ◆ 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 can become a specialist in an indispensable field of electronic engineering”*

“

*Access a wide range of case studies that will help you to strengthen your theoretical knowledge”*

Its teaching staff includes professionals from the field of engineering, who contribute their work experience to this program, as well as renowned specialists from leading companies and prestigious universities.

Its multimedia content, developed with the latest educational technology, will allow professionals to learn in a contextual and situated learning environment, i.e., a simulated environment that will provide immersive specialization for real situations.

This program is designed around Problem-Based Learning, where professionals must try to solve the different professional practice situations that arise throughout the program. For this purpose, the student will be assisted by an innovative interactive video system created by renowned and experienced experts.

*The newest teaching methodology to help you study without any complications.*

*TECH is a 21st century university that is committed to digital teaching as the main learning method.*





# 02 Objectives

The successful completion of this TECH program will enable students to obtain the necessary qualification to understand, design and repair Embedded Electronic Systems. An objective that will be achieved through a first-class academic program that is fully up to date with the latest developments in the sector, as well as the desire and effort that students will have to put into their studies to be constant and develop the skills that will allow them to become the best professionals in the sector.





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*A program with which you can become a specialist in the realization of circuits for electronic systems”*

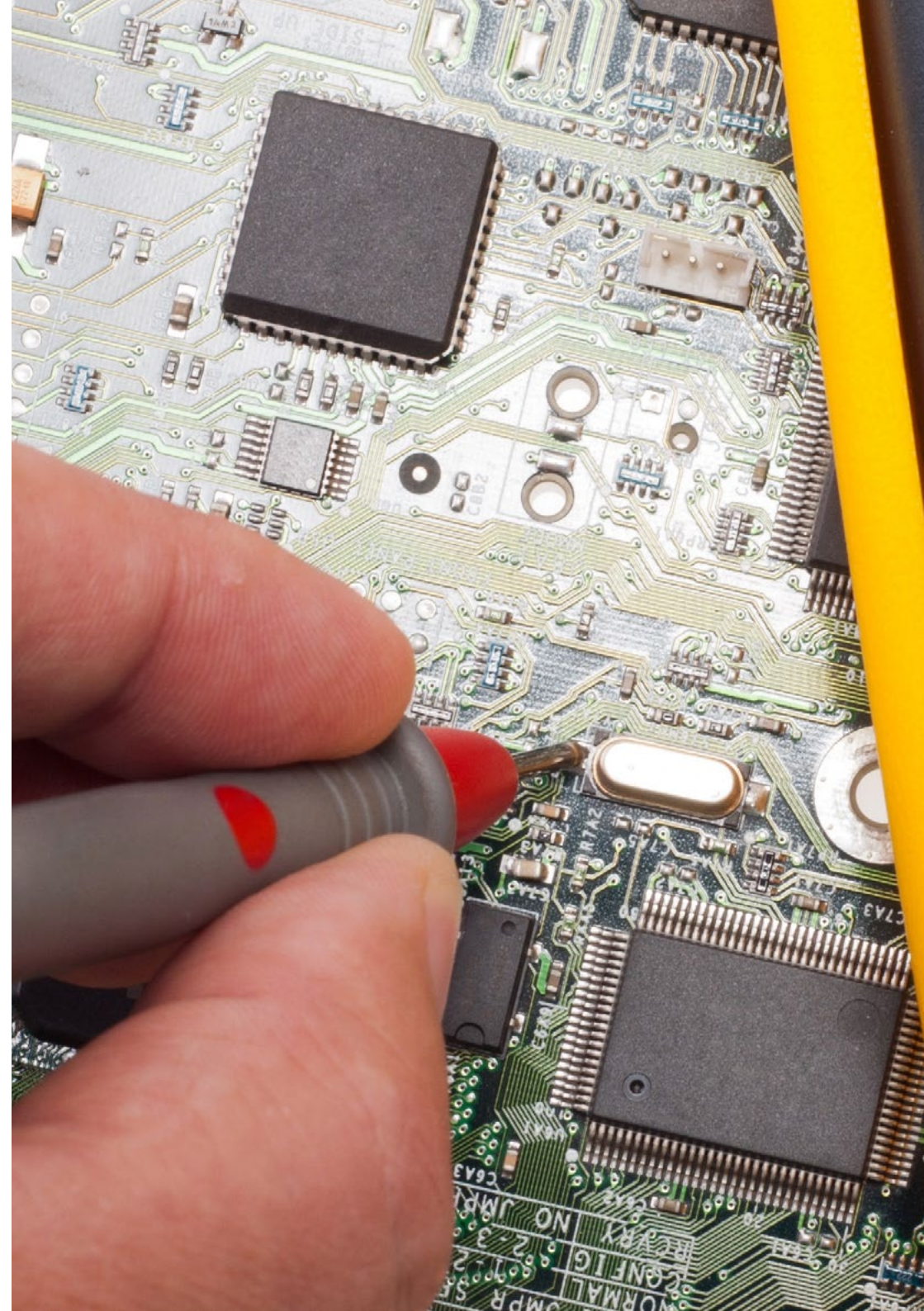




## General Objectives

- ◆ Analyze current techniques to implement sensor networks
- ◆ Determine real-time requirements for embedded systems
- ◆ Evaluate microprocessor processing times
- ◆ Propose solutions adapted to the specific requirements of IoT
- ◆ Determine the stages of an electronic system
- ◆ Analyze the schematics of an electronic system
- ◆ Develop the schematics of an electronic system by virtually simulating its behavior
- ◆ Examine the behavior of an electronic system
- ◆ Design the implementation support of an electronic system
- ◆ Implement a prototype electronic system
- ◆ Test and validate the prototype
- ◆ Propose the prototype for commercialization

“*A specific program on embedded systems that will be fundamental for your expertise in this field*”







## Specific Objectives

### Module 1. Embedded Systems

- ◆ Analyze current embedded system platforms focused on signal analysis and IoT management
- ◆ Analyze the diversity of simulators for configuring distributed embedded systems
- ◆ Generate wireless sensor networks
- ◆ Verify and assess risks of violation of sensor networks
- ◆ Process and analyze data using distributed systems platforms
- ◆ Programming microprocessors
- ◆ Identify and correct errors in a real or simulated system

### Module 2. Electronic Systems Design

- ◆ Identify possible problems in the distribution of circuit elements
- ◆ Establish the necessary stages for an electronic circuit
- ◆ Evaluate the electronic components to be used in the design
- ◆ Simulate the behavior of the electronic components as a whole
- ◆ Show the correct operation of an electronic system
- ◆ Transfer the design to a Printed Circuit Board (PCB)
- ◆ Implement the electronic system by compiling those modules that require it
- ◆ Identify potential weak points in the design



03

# Course Management

This TECH Postgraduate Certificate has been developed by a team of experts in Embedded Electronic Systems. Leading electronics engineers who have dedicated a large part of their professional careers to training and specialization in order to offer their students the most relevant information in this field, which they can then transfer to their daily practice. A faculty able to provide students with the most comprehensive knowledge of embedded systems and electronic system design, with the sole purpose of helping them grow professionally.





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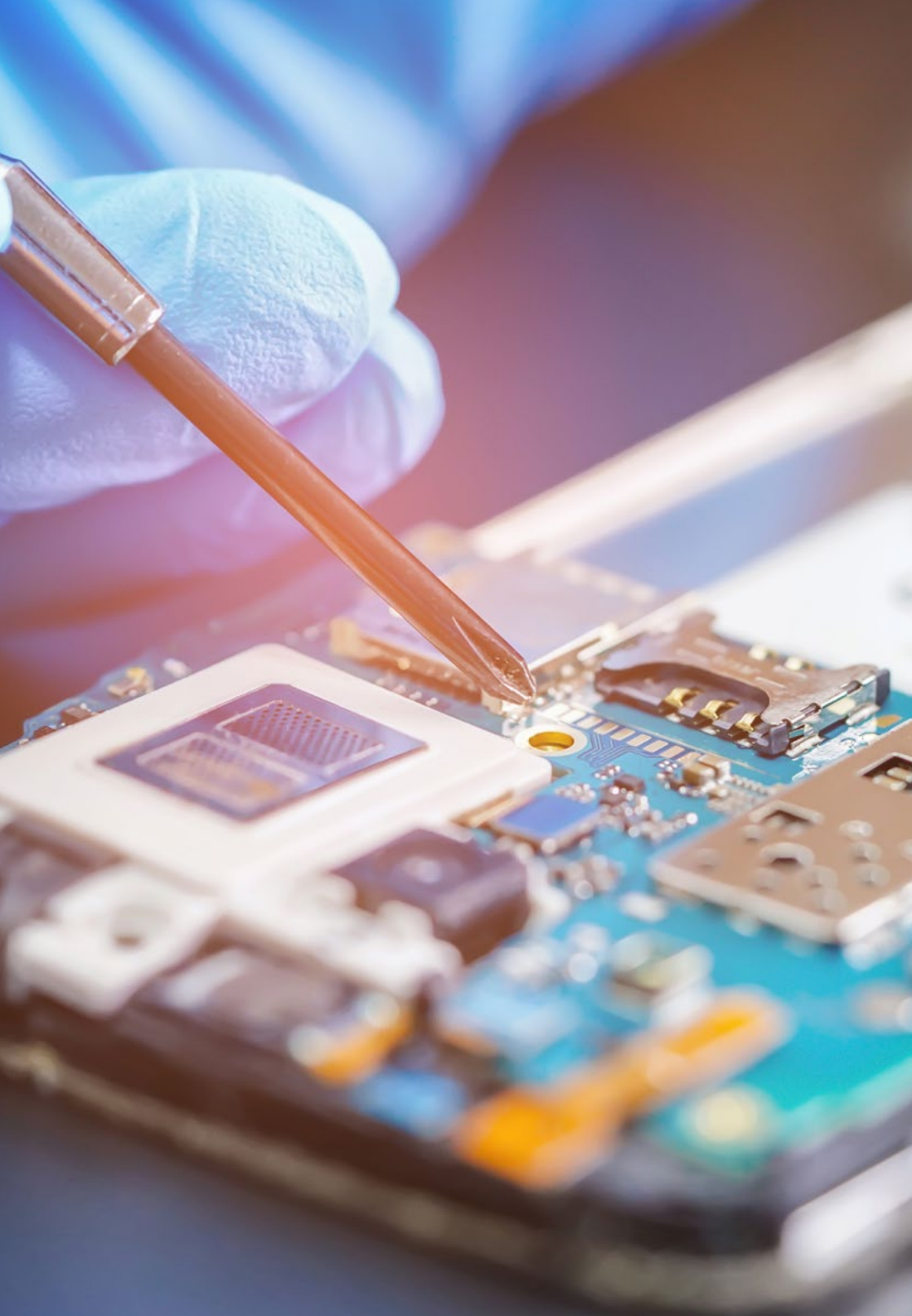
*The best faculty at the moment to help  
you grow professionally in this field”*

## Management



### Ms. Casares Andrés, María Gregoria

- ♦ Associate Professors, Carlos III University of Madrid
- ♦ Degree in IT Polytechnic University of Madrid
- ♦ Research Sufficiency Polytechnic University of Madrid
- ♦ Research Sufficiency, Carlos III University of Madrid
- ♦ Evaluator and Creator of OCW courses at Carlos III University of Madrid
- ♦ INTEF courses tutor
- ♦ Support Technician, Ministry of Education Directorate General of Bilingualism and Quality of Education of the Community of Madrid
- ♦ Secondary Education Professor with specialty in IT
- ♦ Associate professor at the Pontificia de Comillas University
- ♦ Postgraduate Diploma in Teaching Unit, Community of Madrid
- ♦ Analyst/ IT Project manager, Banco Urquijo
- ♦ IT Analyst at ERIA



## Professors

### Mr. García Vellisca, Mariano Alberto

- ◆ Professor of Vocational Training and Moratalaz Secondary School
- ◆ Doctor in Biomedical Engineering from the Polytechnic University of Madrid  
Collaborator in the Discovery Research- CTB Programming. Polytechnic University of Madrid
- ◆ Senior Research Officer in the BCI-NE research group at the University of Essex, UK
- ◆ Research Officer at the Biomedical Technology Center of the Polytechnic University of Madrid
- ◆ Electronics Engineer at Tecnologia GPS S.A
- ◆ Electronics Engineer at Relequick S.A
- ◆ Engineer in Electronics from the Complutense University of Madrid
- ◆ Master's Degree in Biomedical Engineering from the Polytechnic University of Madrid

### Dr. Fernández Muñoz, Javier

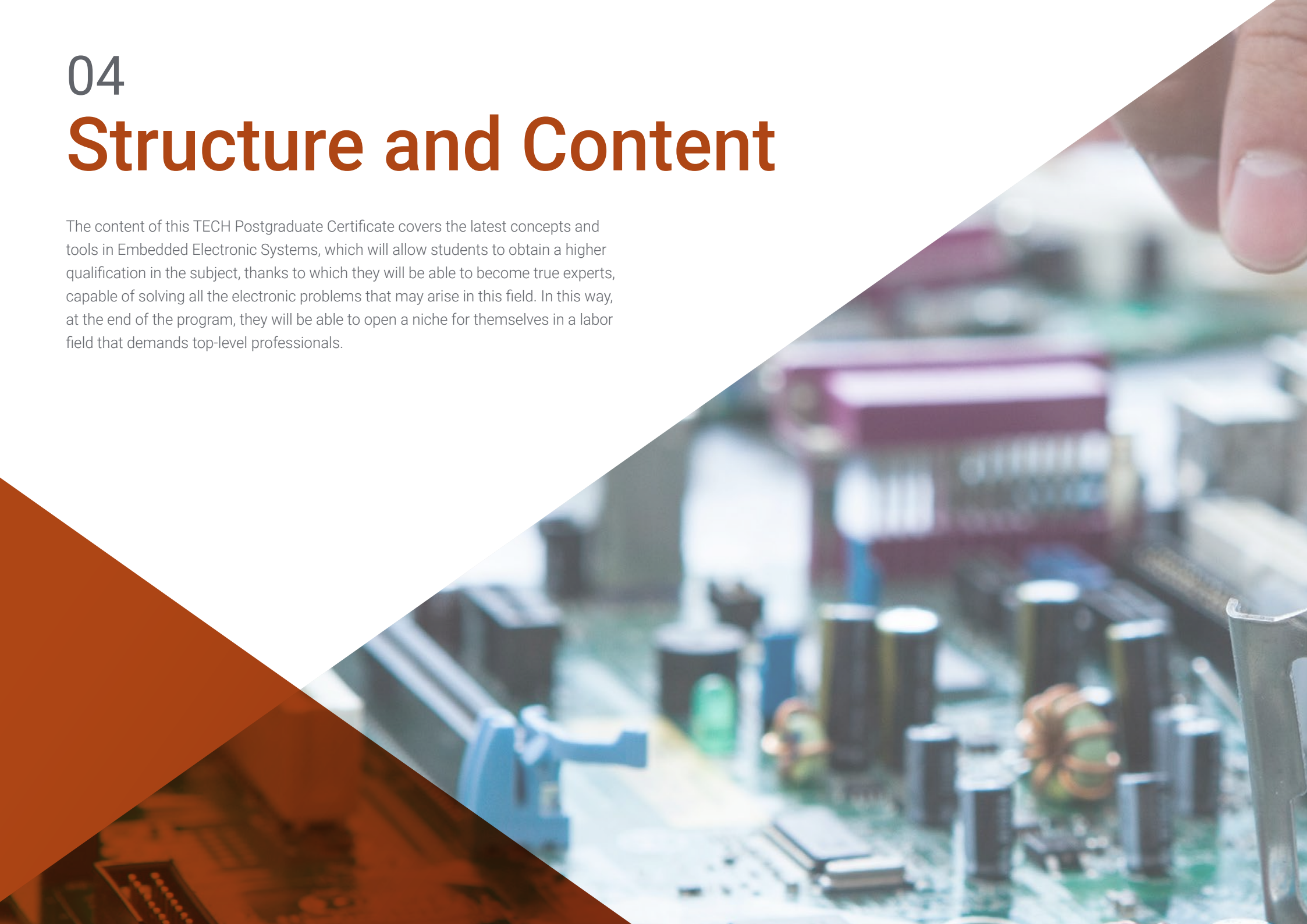
- ◆ University Professor. Carlos III University of Madrid
- ◆ Degree in IT specialist Engineering from the Carlos III University of Madrid
- ◆ Degree in IT from the Polytechnic University of Madrid




# 04

# Structure and Content

The content of this TECH Postgraduate Certificate covers the latest concepts and tools in Embedded Electronic Systems, which will allow students to obtain a higher qualification in the subject, thanks to which they will be able to become true experts, capable of solving all the electronic problems that may arise in this field. In this way, at the end of the program, they will be able to open a niche for themselves in a labor field that demands top-level professionals.







“Take a self-guided study of this Postgraduate Certificate and become a specialist in Embedded Electronic Systems”

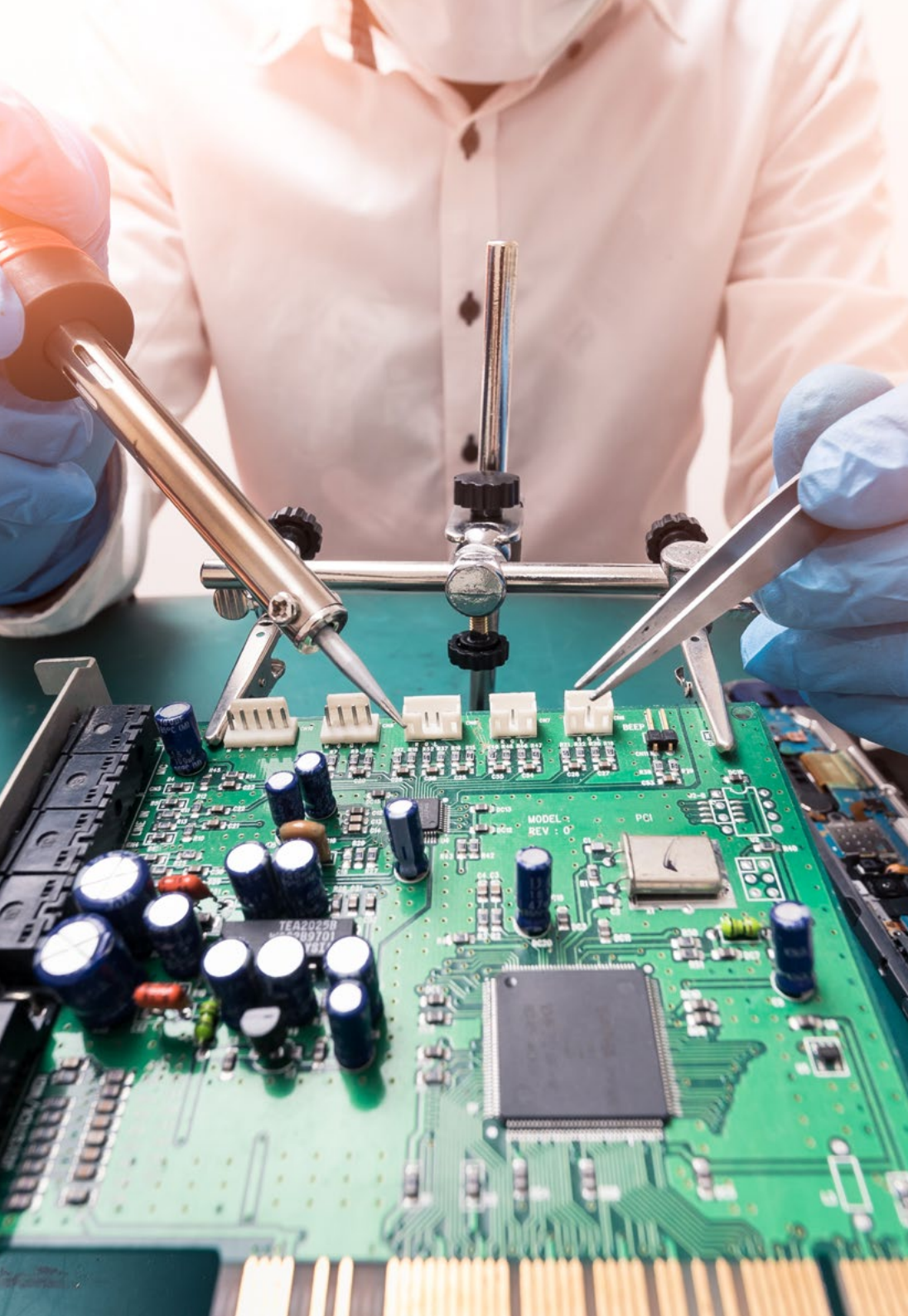
## Module 1. Embedded Systems

- 1.1. Embedded Systems
  - 1.1.1. Embedded System
  - 1.1.2. Requirements for Embedded Systems and Benefits
  - 1.1.3. Evolution of Embedded Systems
- 1.2. Microprocessors
  - 1.2.1. Evolution of Microprocessors
  - 1.2.2. Families of Microprocessors
  - 1.2.3. Future Trend
  - 1.2.4. Commercial Operating System
- 1.3. Structure of a Microprocessor
  - 1.3.1. Basic Structure of a Microprocessor
  - 1.3.2. Central Processing Unit
  - 1.3.3. Input and Output
  - 1.3.4. Buses and Logical Levels
  - 1.3.5. Structure of a System Based on Microprocessors
- 1.4. Processing Platforms
  - 1.4.1. Cyclic Executive Operation
  - 1.4.2. Events and Interruptions
  - 1.4.3. Hardware Management
  - 1.4.4. Distributed Systems
- 1.5. Analysis and Design of Programs for Embedded Systems
  - 1.5.1. Requirements Analysis
  - 1.5.2. Design and Integration
  - 1.5.3. Implementation, Tests and Maintenance
- 1.6. Operating Systems in Real Time
  - 1.6.1. Real Time, Types
  - 1.6.2. Operating Systems in Real Time. Requirements
  - 1.6.3. Microkernel Architecture
  - 1.6.4. Planning
  - 1.6.5. Task Management and Interruptions
  - 1.6.6. Advanced Operating System

- 1.7. Design Technique of Embedded Systems
  - 1.7.1. Sensors and Magnitudes
  - 1.7.2. Low Power Modes
  - 1.7.3. Embedded Systems Languages
  - 1.7.4. Peripherals
- 1.8. Networks and Multiprocessors in Embedded Systems
  - 1.8.1. Types of Networks
  - 1.8.2. Distributed Embedded Systems Networks
  - 1.8.3. Multiprocessors
- 1.9. Embedded Systems Simulators
  - 1.9.1. Commercial Simulators
  - 1.9.2. Simulation Parameters
  - 1.9.3. Error Checking and Error Handling
- 1.10. Embedded Systems for the Internet of Things (IoT)
  - 1.10.1. IoT
  - 1.10.2. Wireless Sensor Networks
  - 1.10.3. Attacks and Protective Measures
  - 1.10.4. Resources Management
  - 1.10.5. Commercial Platforms

## Module 2. Electronic Systems Design

- 2.1. Electronic Design
  - 2.1.1. Resources for the Design
  - 2.1.2. Simulation and Prototype
  - 2.1.3. Testing and Measurements
- 2.2. Circuit Design Techniques
  - 2.2.1. Schematic Drawing
  - 2.2.2. Current Limiting Resistors
  - 2.2.3. Voltage Dividers
  - 2.2.4. Special Resistance
  - 2.2.5. Transistors
  - 2.2.6. Errors and Precision



- 2.3. Power Supply Design
  - 2.3.1. Choice of Power Supply
    - 2.3.1.1. Common Voltage
    - 2.3.1.2. Design of a Battery
  - 2.3.2. Switch-Mode Power Supplies
    - 2.3.2.1. Types
    - 2.3.2.2. Pulse Width Modulation
    - 2.3.2.3. Components
- 2.4. Amplifier Design
  - 2.4.1. Types
  - 2.4.2. Specifications
  - 2.4.3. Gain and Attenuation
    - 2.4.3.1. Input and Output Impedances
    - 2.4.3.2. Maximum Power Transfer
  - 2.4.4. Design with Operational Amplifiers (OP AMP)
    - 2.4.4.1. DC Connection
    - 2.4.4.2. Open Loop Operation
    - 2.4.4.3. Frequency Response
    - 2.4.4.4. Upload Speed
  - 2.4.5. OP AMP Applications
    - 2.4.5.1. Inverters
    - 2.4.5.2. Buffer
    - 2.4.5.3. Adder
    - 2.4.5.4. Integrator
    - 2.4.5.5. Restorer
    - 2.4.5.6. Instrumentation Amplification
    - 2.4.5.7. Error Source Compensator
    - 2.4.5.8. Comparator
  - 2.4.6. Power Amplifier



- 2.5. Oscillator Design
  - 2.5.1. Specifications
  - 2.5.2. Sinusoidal Oscillators
    - 2.5.2.1. Vienna Bridge
    - 2.5.2.2. Colpitts
    - 2.5.2.3. Quartz Crystal
  - 2.5.3. Clock Signal
  - 2.5.4. Multivibrators
    - 2.5.4.1. Schmitt Trigger
    - 2.5.4.2. 555
    - 2.5.4.3. XR2206
    - 2.5.4.4. LTC6900
  - 2.5.6. Frequency Synthesizers
    - 2.5.6.1. Phase Tracking Loop (PTL)
    - 2.5.6.2. Direct Digital Synthesizer (DDS)
- 2.6. Design of Filters
  - 2.6.1. Types
    - 2.6.1.1. Low Pass
    - 2.6.1.2. High Pass
    - 2.6.1.3. Band Pass
    - 2.6.1.4. Band Eliminator
  - 2.6.2. Specifications
  - 2.6.3. Behavior Models
    - 2.6.3.1. Butterworth
    - 2.6.3.2. Bessel
    - 2.6.3.3. Chebyshev
    - 2.6.3.4. Elliptical
  - 2.6.4. RC Filters
  - 2.6.5. LC Filters Band Pass
  - 2.6.6. Band-Stop Filter
    - 2.6.6.1. Twin-T
    - 2.6.6.2. LC Notch
  - 2.6.7. Active RC Filters





- 2.7. Electromechanical Design
  - 2.7.1. Contact Switch
  - 2.7.2. Electromechanical Relays
  - 2.7.3. Solid State Relays (SSR)
  - 2.7.4. Coils
  - 2.7.5. Engines
    - 2.7.5.1. Ordinary
    - 2.7.5.2. Servomotors
- 2.8. Digital Design
  - 2.8.1. Basic Logic of Integrated Circuits (ICs)
  - 2.8.2. Programmable Logic
  - 2.8.3. Microcontrollers
  - 2.8.4. DeMorgan's Theorems
  - 2.8.5. Functional Integrated Circuits
    - 2.8.5.1. Decoders
    - 2.8.5.2. Multiplexers
    - 2.8.5.3. Demultiplexers
    - 2.8.5.4. Comparators
- 2.9. Programmable Logic Devices and Microcontrollers
  - 2.9.1. Programmable Logic Device (PLD)
    - 2.9.1.1. Programming
  - 2.9.2. Field Programmable Logic Gate Array (FPGA)
    - 2.9.2.1. VHDL and Verilog Language
  - 2.9.3. Designing with Microcontrollers
    - 2.9.3.1. Embedded Microcontroller Design
- 2.10. Choosing Components
  - 2.10.1. Resistance
    - 2.10.1.1. Resistor Encapsulation
    - 2.10.1.2. Manufacturing Materials
    - 2.10.1.3. Standard Values
  - 2.10.2. Capacitors
    - 2.10.2.1. Capacitor Packages
    - 2.10.2.2. Manufacturing Materials
    - 2.10.2.3. Code of Values
  - 2.10.3. Coils
  - 2.10.4. Diodes
  - 2.10.5. Transistors
  - 2.10.6. Integrated Circuits



*A first-class program aimed at professionals seeking academic and professional excellence”*

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.

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*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

This Postgraduate Certificate in Embedded Electronic Systems guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate issued by TECH Technological University.



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

This **Postgraduate Certificate in Security Systems** 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 certificate 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: **Postgraduate Certificate in Embedded Electronic Systems**

Official N° of Hours: **300 h.**



\*Apostille Convention. In the event that the student wishes to have their paper certificate 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 quality  
development languages  
virtual classroom



## Postgraduate Certificate Embedded Electronic Systems

Course Modality: Online

Duration: 12 weeks

Certificate: TECH Technological University

Teaching Hours: 300 h.

# Postgraduate Certificate Embedded Electronic Systems

