Postgraduate Diploma Embedded Electronic Systems





Postgraduate Diploma Embedded Electronic Systems

Course Modality: Online Duration: 6 months Certificate: TECH Technological University Teaching Hours: 450 h. Website: www.techtitute.com/us/engineering/postgraduate-diploma/postgraduate-diploma-embedded-electronic-systems

Index



06 Certificate

01 Introduction

Embedded Electronic Systems, also called integrated systems, develop current software and hardware techniques to solve problems that require real-time signal processing. They are widely used today, and can be found in different aspects of everyday life, such as a taximeter or an access control system. Their regular use requires the existence of specialized professionals capable of designing, executing, controlling and, if necessary, repairing them. Therefore, TECH offers engineering professionals a golden opportunity to become specialized in an area of high demand, acquiring specific knowledge on Embedded Electronic Systems that they will be able to put into practice during their daily work.

If you are fascinated by electronic engineering and are looking for an opportunity to specialize in embedded systems, this is the program for you"

tech 06 | Introduction

Technological developments have led to the existence of multiple applications and tools that make people's daily lives easier. Many of these mechanisms run in real time and therefore require embedded systems to operate. Thinking about the need for expertise of engineers in this field, TECH has designed this Postgraduate Certificate in Embedded Electronic Systems with the aim of offering superior qualifications that will place them at the forefront of their profession. A top-level program, designed by experts in the field, in which you will find all the theoretical and practical resources necessary to develop the skills that will allow you to stand out in a booming sector.

The syllabus of this Postgraduate Diploma covers the most fundamental issues of embedded systems, but also the design of electronic systems, which will make it possible, for example, to examine the casings of electronic devices with an increasingly high level of integration. Furthermore, it includes the study of Smart Grids or intelligent electrical networks and the deployment of the technologies that comprise them, which will allow a more efficient management of energy flows, adjusting much more dynamically to changes in energy supply and demand.

Definitively, a 100% online Postgraduate Diploma that will allow students to distribute their study time, not being conditioned by fixed schedules or having the need to move to another physical location, being able to access all the contents at any time of the day, balancing their work and personal life with their academic life.

This **Postgraduate Diploma 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



Introduction | 07 tech

Take this Postgraduate Diploma and increase your employability options in a short time"

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. Enroll in this Postgraduate Diploma and have unlimited access to all its theoretical and practical resources.

TECH is a university with an international vision and, therefore, offers its students a top-quality program with which to compete in a globalized environment.

02 **Objectives**

The main objective of this program in Embedded Electronic Systems at TECH is to help students become true electronic engineers, capable of devising tools and applications that are of great utility for people's daily use. For this purpose, it offers a rich academic program, in which you will find the most up-to-date information on the design of electronic systems and energy efficiency, as well as on the particularities of embedded systems.

Objectives | 09 tech

GG

7 - -

A knowledge of the particularities of Embedded Electronic Systems will bring a plus of quality to your work as an engineer"

tech 10 | Objectives



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
- Determine the advantages of Smart grids deployment
- Analyze each of the technologies on which Smart grids are based
- Examine the standards and safety mechanisms valid for the Smart grids





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

Module 3. Energy Efficiency. Smart Grid

- Develop specialized knowledge on energy efficiency and smart grids
- Establish the need for the deployment of Smart grids
- Analyze the functioning of a Smart Meter and its requirement in Smart Grid
- Determine the importance of power electronics in different network architectures
- Assess the advantages and disadvantages of integrating renewable sources and energy storage systems
- Study automation and control tools required in smart grids
- Evaluate the security mechanisms that allow Smart grids to become reliable grids



Learn to design intelligent networks and enter a growing job market in clear expansion"

03 Course Management

The faculty of this TECH Postgraduate Diploma are professionals with extensive experience in the field of Embedded Electronic Systems, but also at the educational and research level. Qualified professionals committed to quality education, who have devised the best academic plan on the market so that students are able to specialize in a sector that requires professionals with extensive knowledge in the field and the necessary skills to put into practice everything they have learned.

A high-level teaching staff to help you improve in this field"

J

tech 14 | Course Management

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

Ms. Escandel Varela, Lorena

- Research Support Technician at the project as Learning from: "System for the provision and consumption of HD multimedia content in means of collective passenger transport based on Li-FI technology for data transmission". Carlos III University of Madrid
- Specialist in Computer Science, at Emprestur, Ministry of Tourism, Cuba
- Specialist in Computer Science at UNE, Empresa Eléctrica, Cuba
- IT and Communications Specialist, Almacenes Universales S.A., Cuba
- Radio Communications Specialist at Santa Clara Air Base, Cuba
- Telecommunications and Electronics Engineering at Universidad Central "Marta Abreu" de las Villas, Santa Clara, Cuba
- Master's Degree in Political and Electoral Analysis from the Carlos III University, Madrid: Leganés Campus, Madrid
- PhD student in Electrical, Electronic and Automation Engineering, Department of Electronic Technology. Carlos III University of Madrid: Leganés Campus

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

Mr. García Vellisca, Mariano Alberto

- Professor of Vocational Training and Moratalaz Secondary School
- PhD's Degree in Biomedical Engineering from the Polytechnic University of Madrid
- Collaborator in the Discovery Research-CTB Program. 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



A stimulating journey of professional growth designed to keep you interested and motivated throughout the entire program"

04 Structure and Content

The syllabus of this Postgraduate Diploma in Embedded Electronic Systems TECH has been designed thinking about the academic needs of engineers, who are looking for continuous specialization to adapt to new market developments. For this purpose, a first-class program has been developed, with which students will be able to specialize in different areas, such as embedded systems, electronic systems design or energy efficiency, which is so necessary nowadays.

A very complete syllabus that will open the doors to a field of knowledge that is totally relevant in today's society"

tech 18 | Structure and Content

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



Structure and Content | 19 tech

- 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 Supplies2.3.2.1. Types2.3.2.2. 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 Connection2.4.4.2. 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

tech 20 | Structure and Content

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
- 2.5.5. Frequency Synthesizers2.5.5.1. Phase Tracking Loop (PTL)2.5.5.2. 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

Structure and Content | 21 tech

Module 3. Energetic Efficiency, Smart Grid

- 3.1. Smart Grids and Microgrids
 - 3.1.1. Smart Grid
 - 3.1.2. Benefits
 - 3.1.3. Obstacles for its Implementation
 - 3.1.4. Microgrids
- 3.2. Measuring Equipment
 - 3.2.1. Architecture
 - 3.2.2. Smart Meters
 - 3.2.3. Sensor Networks
 - 3.2.4. Phasor Measurement Units
- 3.3. Advanced Measuring Infrastructure (AMI)
 - 3.3.1. Benefits
 - 3.3.2. Services
 - 3.3.3. Protocols and Standards
 - 3.3.4. Security/Safety
- 3.4. Distributed Generation and Energy Storage
 - 3.4.1. Generation Technologies
 - 3.4.2. Storage Systems
 - 3.4.3. Electric Vehicle
 - 3.4.4. Microgrids
- 3.5. Power Electronics in the Energy Field
 - 3.5.1. Smart Grid Requirements
 - 3.5.2. Technologies
 - 3.5.3. Applications
- 3.6. Demand Response
 - 3.6.1. Objectives
 - 3.6.2. Applications
 - 3.6.3. Models

- 3.7. General Architecture of Smart Grid
 - 3.7.1. Models
 - 3.7.2. Local Networks: HAN, BAN, IAN
 - 3.7.3. Neighborhood Area Network and Field Area Network
 - 3.7.4. Wide Area Network
- 3.8. Smart Grid Communications
 - 3.8.1. Requirements
 - 3.8.2. Technologies
 - 3.8.3. Communications Standards and Protocols
- 3.9. Interoperability, Standards and Security in Smart Grids
 - 3.9.1. Interoperability
 - 3.9.2. Standards
 - 3.9.3. Security/Safety
- 3.10. Big Data for Smart Grids
 - 3.10.1. Analytical Models
 - 3.10.2. Scope of Application
 - 3.10.3. Data Sources
 - 3.10.4. Storage Systems
 - 3.10.5. Frameworks

A very complete syllabus that will open the doors to a field of knowledge that is totally relevant in today's society"

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.

8

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"

tech 24 | Methodology

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.

Methodology | 25 tech



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.

tech 26 | Methodology

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.



Methodology | 27 tech

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.



tech 28 | Methodology

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.

30%

8%

10%

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.

Methodology | 29 tech



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.



4%

20%

25%

06 **Certificate**

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



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

tech 32 | Certificate

This **Postgraduate Diploma in Embedded Electronic 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 Diploma issued by **TECH Technological University** via tracked delivery*.

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

Title: Postgraduate Diploma in Embedded Electronic Systems Official N° of Hours: 450 h.



*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.

technological university Postgraduate Diploma Embedded Electronic Systems Course Modality: Online Duration: 6 months Certificate: TECH Technological University

Teaching Hours: 450 h.

Postgraduate Diploma Embedded Electronic Systems

