

# Postgraduate Certificate

## Alternative Internal Combustion Engine Injection and Ignition Systems





## Postgraduate Certificate Alternative Internal Combustion Engine Injection and Ignition Systems

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

Website: [www.techtute.com/us/engineering/postgraduate-certificate/alternative-internal-combustion-engine-injection-ignition-systems](http://www.techtute.com/us/engineering/postgraduate-certificate/alternative-internal-combustion-engine-injection-ignition-systems)

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01

# Introduction

The history of engine evolution is intertwined with the growing demand for efficiency and sustainability in production and mobility. In this context where Alternative Internal Fuel Engines have become a critical component of the industry, the need arises to train engineers with practical and updated knowledge in this discipline. Therefore, this program represents the solution to this challenge, providing professionals with the necessary tools and skills. With access to the best teaching materials in 100% online format, this academic proposal guarantees quality learning supported by experts in Aeronautics, where graduates will assimilate the essential competencies to face the present and future challenges of this disruptive field.





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*You will deepen your knowledge of injection and ignition systems under the most effective methodology, the TECH Relearning”*

The technology related to Engine Injection and Ignition Systems is constantly evolving. In this way, optimizing these systems can significantly improve engine efficiency and reduce pollutant emissions, which is critical in a world focused on sustainability and reducing the carbon footprint. As a result, internal combustion engines are still widely used in the automotive industry, which means that there is a constant demand for engineers with expertise in injection and ignition systems.

TECH has therefore developed a qualification with which engineers will be able to contribute to increasing the power, efficiency and service life of engines, which is crucial in critical applications such as freight and aviation.

This is a comprehensive educational program in which the student will learn about the operation of the different systems with injection pumps and will study the components and sensors in Injection Systems. In this way, you will be trained in depth in the diagnosis and troubleshooting of injection and ignition systems.

For this purpose, the engineers will have at their disposal the best materials presented in different audiovisual media. Thanks to the Relearning method, the student will integrate the knowledge in a natural and progressive way. All this in a convenient and completely online mode, without unnecessary travel or pre-established timing.

This **Postgraduate Certificate in Alternative Internal Combustion Engine Injection and Ignition Systems** contains the most complete and up-to-date program on the market.

The most important features include:

- ♦ The development of practical cases presented by experts in Aeronautical Engineering
- ♦ The graphic, schematic and eminently practical contents of the book provide Specialised and practical information on those 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



*Become an elite professional thanks to the skills you will acquire upon graduating from this TECH Postgraduate Certificate"*

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*You will develop efficient projects and master the operation of diesel injection systems, including common rail technology”*

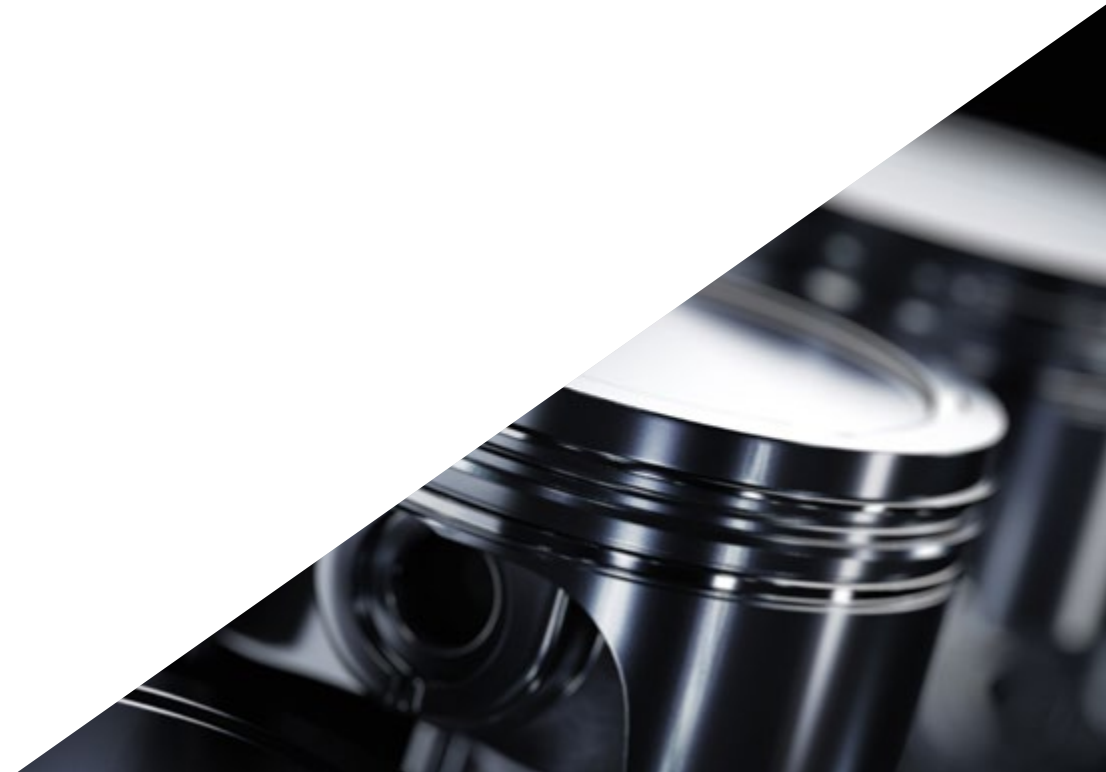
*Access a digital library full of supplementary materials developed by Alternative Internal Combustion Engine Experts.*

*A Postgraduate Certificate that will allow you to get up-to-date in the diagnosis and troubleshooting of injection and ignition systems.*

The program's teaching staff includes professionals from the field who contribute their work experience to this educational 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 education programmed to learn 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 educational year. For this purpose, the students will be assisted by an innovative interactive video system created by renowned and experienced experts.



# 02

# Objectives

Throughout the program, the graduate will develop a deep understanding of mixture formation, combustion chamber types, direct and indirect injection systems, high pressure injection technologies, control and calibration of injection systems, as well as spark ignition technologies. Therefore, graduates of the program will be able to stand out in their professional field in an efficient manner, optimizing engine performance, and analyzing engine maps to improve efficiency, fuel consumption and vehicle power.





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*Boost your professional career at  
TECH with an elite Postgraduate  
Certificate. Only in TECH"*



### General Objective

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- ♦ Analyze the different injection and ignition methods in alternative internal combustion engines, specifying the advantages and challenges of each type of injection system in different applications



*Delve deeper into air-fuel mixture efficiency over the course of this 6-week educational program"*





## Specific Objectives

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- Compile the principles of fuel injection
- Determine the types of fuel injection, their uses and characteristics
- Evaluate how direct and indirect injection affects efficiency and air-fuel mixture formation
- Examine the operation of a diesel injection system: common rail system
- Fundamentals of the different injection and electronic ignition systems
- Analyze the fundamental aspects for the control and calibration of injection systems

03

# Course Management

TECH has an eminent faculty for this Postgraduate Certificate. The members of this teaching staff are, for the most part, experts with extensive experience in cutting-edge areas and industries such as aeronautics. Throughout their careers, these specialists have been linked to companies of international prestige and have participated in the development of innovation projects for the design of Alternative Internal Combustion Engines. Based on their theoretical knowledge and practical skills, these engineers have developed a comprehensive syllabus where students can acquire a holistic view of the advances in this field and its main challenges.



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*You will be advised by a teaching staff specialized in the applications of MCI A in the field of Aeronautics"*

## Management



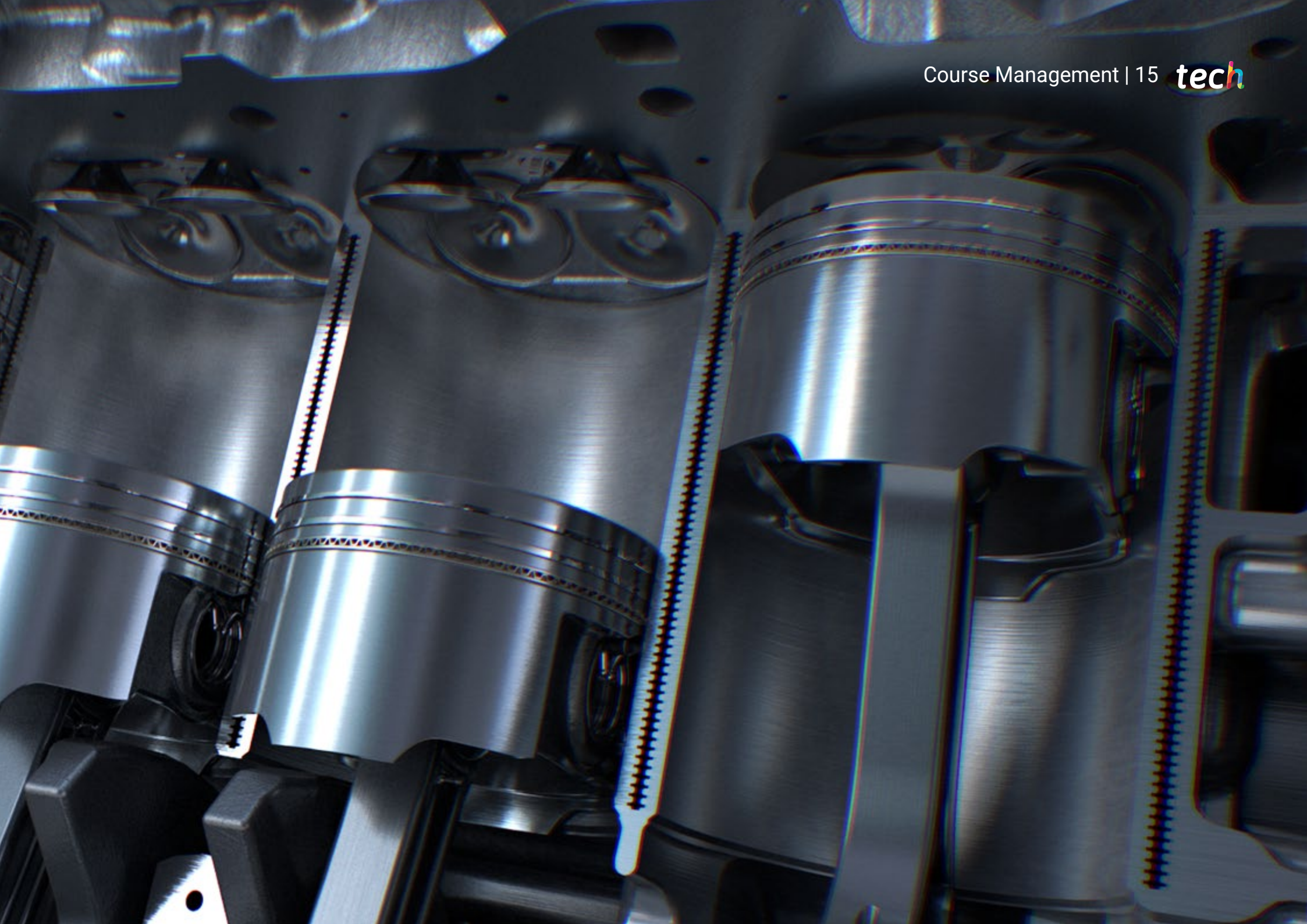
### Mr. Del Pino Luengo, Isatsi

- ♦ Airbus Defence & Space CC295 FWSAR program certification and airworthiness technical manager
- ♦ Airworthiness and certification engineer for the engine section in charge of the MTR390 program at the National Institute for Aerospace Technology (NIAT)
- ♦ Airworthiness engineer and certification for the VSTOL section by the National Institute for Aerospace Technology (NIAT)
- ♦ Aeronautical design and certification engineer for the life extension project of the Spanish Navy AB212 helicopters (PEVH AB212) at Babcock MCSE
- ♦ Design and Certification Engineer in the DOA department at Babcock MCSE
- ♦ Fleet Technical Office Engineer AS 350 B3/ BELL 212/ SA 330 J.Babcock MCSE
- ♦ Qualifying Master's Degree in Aeronautical Engineering from the University of León
- ♦ Aeronautical Technical Engineer in Aeromotors, Polytechnic University of Madrid

## Professors

### Mr. Mariner Bonet, Iñaki

- ♦ Head of Flight Test Office at Avincis Aviation Technics
- ♦ Design, Certification and Test Engineer at Avincis Aviation Technics
- ♦ Calculation and materials engineer at the Aragon Institute of Technology
- ♦ Calculus Engineer at the Polytechnic University of Valencia
- ♦ Master in Flight Test and Aircraft Certification (EASA cat 2) by the Polytechnic University of Madrid
- ♦ Aeronautical Engineer from the Polytechnic University of Valencia



# 04

## Structure and Content

Scientific and technological innovation has led to considerable progress in the injection and ignition systems present in today's MCIA's. This Postgraduate Certificate from TECH Global University is the ideal opportunity for engineers to get up-to-date on the latest trends in this field. In this way, this agenda delves into the most recent parameters for the control and calibration of these machines. You will also master how to interpret and analyze engine maps. In addition, up-to-date materials, complementary readings and other didactic resources in multimedia format and 100% online will be available for the study of these disruptive contents.





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*Complete your specialization in MCI  
injection and ignition systems through  
the multimedia resources that TECH  
puts at your disposal"*

## Module 1. Injection and ignition systems

- 1.1. Fuel Injection
  - 1.1.1. Mixing Formation
  - 1.1.2. Combustion Chamber Types
  - 1.1.3. Mixture Distribution
  - 1.1.4. Injection Parameters
- 1.2. Direct and Indirect Injection Systems
  - 1.2.1. Direct and Indirect Injection in Diesel Engines
  - 1.2.2. Injector Pump System
  - 1.2.3. Operation of a Diesel Injection System: Common Rail System
- 1.3. High Pressure Injection Technologies
  - 1.3.1. In-Line Injection Pump Systems
  - 1.3.2. Rotary Injection Pump Systems
  - 1.3.3. Systems with Single Injection Pumps
  - 1.3.4. Common-Rail Injection Systems
- 1.4. Mixture Formation
  - 1.4.1. Internal Flow in Diesel Injection Nozzles
  - 1.4.2. Jet Description
  - 1.4.3. Atomization Process
  - 1.4.4. Diesel Jet under Evaporative Conditions
- 1.5. Control and Calibration of Injection Systems
  - 1.5.1. Components and Sensors in Injection Systems
  - 1.5.2. Engine Maps
  - 1.5.3. Motor Calibration
- 1.6. Spark Ignition Technologies
  - 1.6.1. Conventional Ignition (Spark Plugs)
  - 1.6.2. Electronic Ignition
  - 1.6.3. Adaptive Ignition
- 1.7. Electronic Ignition Systems
  - 1.7.1. Operation
  - 1.7.2. Ignition Systems
  - 1.7.3. Spark Plugs



- 1.8. Diagnosis and Troubleshooting of Injection and Ignition Systems
  - 1.8.1. Motor-Installation Parameters
  - 1.8.2. Thermodynamic Models
  - 1.8.3. Sensitivity of Combustion Diagnostics
- 1.9. Optimization of Injection and Ignition systems
  - 1.9.1. Engine Map Design
  - 1.9.2. Engine Modeling
  - 1.9.3. Engine Map Optimization
- 1.10. Engine Map Analysis
  - 1.10.1. Torque and Power Map
  - 1.10.2. Engine Efficiency
  - 1.10.3. Fuel Consumption

“Don't wait any longer and enroll in this Postgraduate Certificate that allows you to self-manage your studies without pre-established schedules or evaluations”



# 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.





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*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.



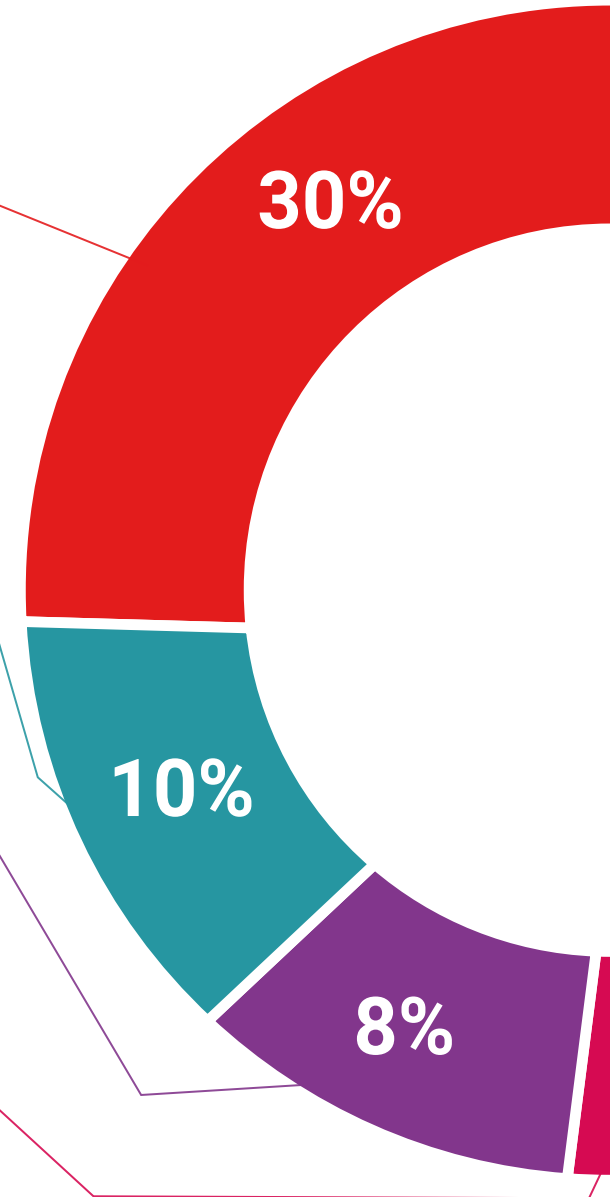
### Practising Skills and Abilities

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

The Postgraduate Certificate in Alternative Internal Combustion Engine Injection and Ignition Systems guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate issued by TECH Global University.





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

This program will allow you to obtain your **Postgraduate Certificate in Alternative Internal Combustion Engine Injection and Ignition Systems** 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** title 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 Alternative Internal Combustion Engine Injection and Ignition Systems**

Modality: **online**

Duration: **6 weeks**

Accreditation: **6 ECTS**



\*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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