

# Postgraduate Certificate Design, Manufacture and Simulation of Internal Combustion Engines



## Postgraduate Certificate Design, Manufacture and Simulation of Internal Combustion Engines

- » Modality: online
- » Duration: 6 weeks
- » Certificate: TECH Technological University
- » Dedication: 16h/week
- » Schedule: at your own pace
- » Exams: online

Website: [www.techtute.com/pk/engineering/postgraduate-certificate/design-manufacture-simulation-internal-combustion-engines](http://www.techtute.com/pk/engineering/postgraduate-certificate/design-manufacture-simulation-internal-combustion-engines)

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# 01

# Introduction

From the historical framework of the industrial revolution to contemporary challenges, engine design and manufacturing engineering has maintained its relevance in society and industry in a constantly evolving world. The demand for efficient and sustainable propulsion systems is more pressing than ever and therein lies the importance of this TECH educational program, which has been designed to address the current needs of the industrial sector. In this way, throughout the syllabus the professional will be able to delve into the design, manufacture and simulation of Alternative Internal Combustion Engines. And it will do so through a 100% online methodology and the best teaching resources.



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*Thanks to this Postgraduate Certificate you will be able to contribute to the development of effective solutions in the field of Engine Engineering”*

From the dawn of the Industrial Revolution, when machines began to change the way societies worked and lived together, to the current technological challenges we face, Combustion Engine Engineering has been in constant evolution. As a result, there is a need to prepare professionals who are up to date with the latest advances in this type of technologies and mechanisms.

In this way, this educational program focuses on the Design and Manufacture of Alternative Internal Combustion Engines, addressing both the theoretical and practical aspects of this area. In this way, students acquire specialized knowledge in the selection of materials to optimize their efficiency and durability, as well as critical analysis skills to solve challenges in Engine Simulation.

In addition, this program is distinguished by a team of subject matter experts with extensive experience in engine engineering and aeronautics. Their orientation and guidance are invaluable in providing students with a quality education. Likewise, the online modality offers flexibility and access to advanced tools. This guarantees an enriching and effective learning experience.

This **Postgraduate Certificate in Design, Manufacture and Simulation of Internal Combustion Engines** contains the most complete and up-to-date program on the market. The most important features include:

- ♦ The development of case studies presented by experts in Engine Engineering
- ♦ The graphic, schematic and practical contents of the book provide theoretical 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



*Start your path to professional success. Prepare yourself with the best Relearning Methodology. Study in the world's best online institution"*

“

*Be part of the technological change and prepare yourself in the field of Engine Engineering thanks to this Postgraduate Certificate"*

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 course. For this purpose, the students will be assisted by an innovative interactive video system created by renowned and experienced experts.

*Get the best knowledge with the online teaching tools offered by TECH: from detailed videos to interactive summaries.*

*Study with the best faculty. Enroll now and give your educational career an immediate boost.*



# 02

# Objectives

The objective of this program is to master the most advanced tools related to the Design, Manufacture and Simulation of Alternative Internal Combustion Engines. All this, with a balanced approach between theoretical and practical elements to make fundamental decisions before the whole process. In addition, the development of critical skills and the resolution of design and manufacturing problems is encouraged. Consequently, students emerge as highly competent professionals in this field of engine engineering, supported by the *Relearning* methodology and with the support of the best experts.







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*Enroll now and master the most professionally demanded skills in the field of Alternative Internal Combustion Engines”*



## General Objectives

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- ◆ Compile the fundamental principles of design, manufacture and simulation of alternative internal combustion engines
- ◆ Develop skills to apply simulation and modeling tools in the design and optimization of engines with the objective of improving efficiency and performance
- ◆ Understand engine testing and validation techniques, including data interpretation and iteration between design and empirical results
- ◆ Determine the theoretical and practical aspects of engine design and manufacturing, promoting the ability to make informed decisions at each stage of the process
- ◆ Encourage critical analysis and problem solving related to the design and manufacture of alternative internal combustion engines



*Be the professional that the engine engineering industry is looking for. Get qualified with the best Relearning methodology in the world's best online university"*





## Specific Objectives

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- ◆ Develop the key concepts in the design of combustion chambers, considering the relationship between geometry and combustion efficiency
- ◆ Analyze the different materials and manufacturing processes applicable to engine components, considering factors such as resistance, temperature and durability
- ◆ Evaluate the importance of precise tolerances and adjustments in the efficient and durable operation of motors
- ◆ Use simulation software to model engine behavior under various conditions and optimize engine performance
- ◆ Determine validation tests on test benches to evaluate performance, durability and efficiency of motors
- ◆ Examine the lubrication, cooling, timing, valve, feed, ignition and exhaust systems in detail, considering their influence on overall engine performance

03

# Course Management

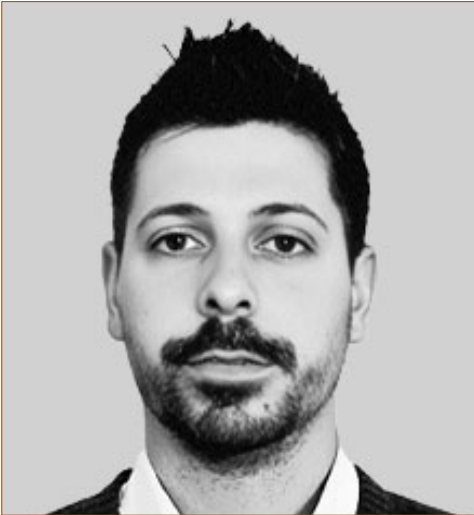
This Postgraduate Certificate is distinguished by its excellence, since it is directed by a team of highly specialized professionals in the field of aeronautical engineering. These experts not only have a deep theoretical knowledge, but also a vast practical experience in engine design and development. In addition, the educational program includes state-of-the-art online tools, such as interactive simulations and discussion forums, allowing students to acquire theoretical knowledge and its applications.



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*You will be guided by leading experts  
in the field of Engine Engineering"*

## 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



04

# Structure and Content

The Postgraduate Certificate in Design Engineering, Manufacturing and Simulation of Alternative Internal Combustion Engines is built as an exceptional opportunity to immerse yourself in a relevant growth field. This program provides specialized knowledge covering crucial topics such as combustion chamber design and efficiency. In addition, material selection is explored to further maximize strength and durability. This program balances theory with practice so that professionals can lead with the knowledge acquired with the *Relearning* methodology that allows them to internalize the topics in a dynamic way.





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*Unlock your potential by specializing  
in Combustion Engine Engineering”*

## Module 1. Design, Manufacture and Simulation of Alternative Internal Combustion Engines (ICE)

- 1.1. Combustion Chamber Design
  - 1.1.1. Combustion Chamber Types
    - 1.1.1.1. Compact, Wedge-Shaped, Hemispherical
  - 1.1.2. Relationship between Chamber Shape and Combustion Efficiency
  - 1.1.3. Design Strategies
- 1.2. Materials and Fabrication Processes
  - 1.2.1. Material Selection for Critical Engine Components
  - 1.2.2. Mechanical, Thermal and Chemical Properties Required for Different Parts
  - 1.2.3. Manufacturing Processes
    - 1.2.3.1. Casting, Forging, Machining
  - 1.2.4. Strength, Durability and Weight in the Choice of Materials
- 1.3. Tolerances and Adjustments
  - 1.3.1. Motor Assembly and Operation Tolerances
  - 1.3.2. Adjustments to Prevent Leaks, Vibrations and Premature Wear and Tear
  - 1.3.3. Influence of Tolerances on Engine Efficiency and Performance
  - 1.3.4. Measuring Methods and Tolerance Control during Manufacture
- 1.4. Simulation and Modeling of Engines
  - 1.4.1. Use of Simulation Software to Analyze the Behavior of the Engine
  - 1.4.2. Gas Flow, Combustion and Heat Transfer Modeling
  - 1.4.3. Virtual Optimization of Design Parameters for Performance Improvement
  - 1.4.4. Correlation between Simulation Results and Experimental Tests
- 1.5. Engine Testing and Validation
  - 1.5.1. Test Design and Execution
  - 1.5.2. Verification of Simulation Results
  - 1.5.3. Iteration between Simulation and Testing
- 1.6. Test Benches
  - 1.6.1. Test Benches. Function and Types
  - 1.6.2. Instrumentation and Measurements
  - 1.6.3. Interpretation of Results and Adjustments to the Design Based on the Tests





- 1.7. Design and Fabrication: Lubrication and Cooling System
  - 1.7.1. Functions of Lubrication and Cooling Systems
  - 1.7.2. Lubrication Circuit Design and Oil Selection
  - 1.7.3. Air and Liquid Cooling Systems
    - 1.7.3.1. Radiators, Pumps and Thermostats
  - 1.7.4. Maintenance and Monitoring to Prevent Overheating and Wear and Tear
- 1.8. Design and Fabrication: Distribution Systems and Valves
  - 1.8.1. Distribution Systems: Synchronization and Motor Efficiency
  - 1.8.2. Types of Systems and Their Manufacture
    - 1.8.2.1. Camshaft, Variable Valve Timing, Valve Drive
  - 1.8.3. Design of Cam Profiles to Optimize Valve Opening and Closing
  - 1.8.4. Design to avoid Interference and Improve Cylinder Filling
- 1.9. Design and Fabrication: Power, Ignition and Exhaust System
  - 1.9.1. Design of Fueling Systems to Optimize the Air-Fuel Mix
  - 1.9.2. Function and Design of Ignition Systems for Efficient Combustion
  - 1.9.3. Exhaust System Design to Improve Efficiency and Reduce Emissions
- 1.10. Practical Analysis of Engine Modeling
  - 1.10.1. Practical Application of Design and Simulation Concepts in a Case Study
  - 1.10.2. Modeling and Simulation of a Specific Engine
  - 1.10.3. Evaluation of Results and Comparison with Experimental Data
  - 1.10.4. Feedback to Improve Future Designs and Manufacturing Processes



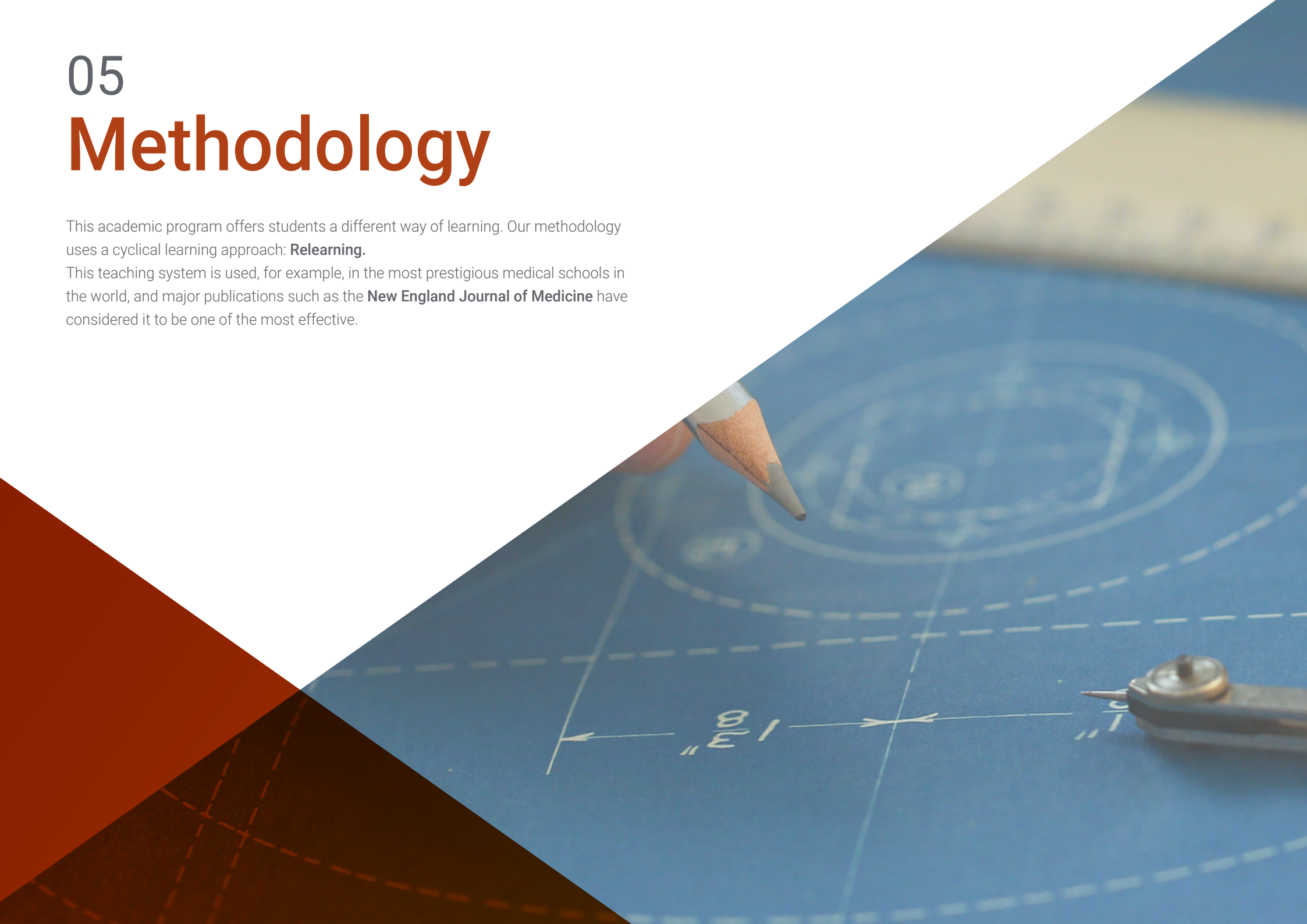
*Learn about Engines in a learning environment designed by the real experts. Join TECH"*

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, Manufacture and Simulation of Internal Combustion Engines 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 Design, Manufacture and Simulation of Internal Combustion Engines** 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 Design, Manufacture and Simulation of Internal Combustion Engines**

Official N° of Hours: **150 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  
development languages  
virtual classroom



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