

# Postgraduate Certificate Alternative Internal Combustion Engines Research and Development





## Postgraduate Certificate Alternative Internal Combustion Engines Research and Development

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

Website: [www.techtitute.com/us/engineering/postgraduate-certificate/alternative-internal-combustion-engine-research-development](http://www.techtitute.com/us/engineering/postgraduate-certificate/alternative-internal-combustion-engine-research-development)

# Index

01

Introduction

---

*p. 4*

02

Objectives

---

*p. 8*

03

Course Management

---

*p. 12*

04

Structure and Content

---

*p. 16*

05

Methodology

---

*p. 20*

06

Certificate

---

*p. 28*

# 01

# Introduction

Artificial Intelligence has been part of the automotive industry for several years. However, in recent times, its applications are increasing, reaching to regulate the amount of fuel entering the machinery and in this way avoiding indiscriminate consumption and helping to reduce environmental pollution. Professionals need to keep abreast of these innovations to be able to successfully exercise their skills in a continuously evolving industry. To acquire these skills, this TECH program integrates the latest approaches to machine learning that have transformed vehicle propulsion. The approach to these contents is developed through a 100% online methodology and with the academic guidance of the most prestigious and experienced specialists.



“

*This program will strengthen your knowledge of zero pollution priorities in the automotive industry in a fast, flexible and 100% online way"*

Throughout history, the automotive industry has emerged as one of the main sources of greenhouse gas emissions into the atmosphere. Its harmful impact is closely related to climate change and air pollution. In this context, the need for cleaner engines and technological strategies has become a priority for those seeking to minimize the environmental cost of this sector.

However, the challenges are enormous. On the one hand, the manufacture of electric or hybrid vehicles has increased but charging and maintenance infrastructures are still insufficient. In parallel, studies on hydrogen engines face similar problems. Nevertheless, this field of engineering continues to innovate in the search for better solutions and to develop cutting-edge projects.

TECH has brought together the main advances in this area of knowledge in a comprehensive program. In this way, this Postgraduate Certificate delves into the design of engines that meet the highest efficiency, performance and sustainability requirements. Furthermore, the syllabus addresses the economic and commercial outlook of the automotive industry. In this sense, it also analyzes the research perspectives and government policies that drive its evolution. Industrial applications of these mechanisms in specific sectors such as maritime transport and aerospace are also analyzed.

To access these disruptive contents, engineers have at their disposal a very complete Virtual Campus. TECH brings together recent research, complementary readings and a variety of multimedia resources. In addition, all of these materials can be reviewed in their entirety 24 hours a day, 7 days a week. To do so, graduates only need a mobile device connected to the Internet, since the university program does not have restrictive schedules. At the same time, in order to strengthen the mastery of the aspects addressed in the syllabus, they have the exclusive Relearning teaching system. An ideal strategy to incorporate the most revolutionary concepts into your professional practice.

This **Postgraduate Certificate in Alternative Internal Combustion Engines Research and Development** 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 practical contents with which they are created, provide scientific and practical information on the disciplines that are essential for professional practice
- ♦ Practical exercises where self-assessment can be used 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



*Delve into future trends in engine management systems through this comprehensive university program"*

“

*The educational experience in a convenient 100% online format that will save you from unnecessary travel to get up-to-date on automotive development”*

*Don't miss the opportunity to expand your skills with the best experts in the automotive industry.*

*TECH offers you multimedia content to support you in achieving your objectives with an educational program in only 180 hours.*

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

This academic program in Alternative Internal Combustion Engines Research and Development has been designed to provide the graduate with a mastery of the latest trends in the sector. To this end, TECH provides various teaching and technological tools, successfully consolidating the development of this program. In this way, at the end of the program, engineers will have advanced skills and will be able to apply the latest trends in battery technology and the extension of automotive autonomy.





“

*In TECH you will have exclusive contents  
and continuous access to them from a  
100% online learning platform”*



## General Objectives

---

- ♦ Analyze the state of the art of Alternative Internal Combustion Engines (AICE)
- ♦ Identify conventional Alternative Internal Combustion Engines, (AICEs)
- ♦ Examine the different aspects to be taken into account in the life cycle of AICEs
- ♦ Compile the fundamental principles of design, manufacture and simulation of reciprocating internal combustion engines
- ♦ Fundamentals of 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
- ♦ 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
- ♦ Determine the natural vibration of internal combustion engines, modally analyzing their frequency and dynamic response, the impact on engine noise in normal and abnormal operation
- ♦ Study applicable vibration and noise reduction methods, international regulations and impact on transportation and industry
- ♦ Analyze how the latest technologies are redefining energy efficiency and reducing emissions in internal combustion vehicles
- ♦ Explore in depth Miller cycle engines, controlled compression ignition (HCCI), compression ignition (CCI) and other emerging concepts
- ♦ Analyze the technologies that enable compression ratio adjustment and their impact on efficiency and performance
- ♦ Fundamentals of integrating multiple approaches, such as the Atkinson-Miller cycle and spark controlled ignition (SCCI), to maximize efficiency under a variety of conditions
- ♦ Delve into the principles of engine data analysis
- ♦ Analyze the different alternative fuels on the market, their properties and characteristics, storage, distribution, emissions and energy balance
- ♦ Analyze the different systems and components of hybrid and electric motors
- ♦ Determine the energy control and management methods, their optimization criteria and their implementation in the transportation sector
- ♦ Fundamentals of an in-depth and up-to-date understanding of the challenges, innovations and future prospects in the field of engine research and development, with a focus on alternative internal combustion engines and their integration with advanced technologies and emerging propulsion systems



## Specific Objectives

---

- Analyze the economic and commercial prospects of internal combustion and reciprocating engines, exploring how they influence research and development investment as well as business strategies
- Develop the ability to understand and design policies and strategies to promote innovation in engines, considering the role of governments and companies in this process
- Explore emerging trends and analyze the different sectors and their future prospects



*You will achieve your goals thanks to the teaching tools that TECH offers and on the way where you will be accompanied by the best professionals"*

03

# Course Management

The students of this university program will have access to a highly qualified teacher specialized in the design and certification of aeronautical projects. Their experience and solid skills have allowed them to implement the most advanced development software and techniques in different tasks with the most cutting-edge companies in the sector. Thanks to their participation in this program, graduates will have 6 weeks to update themselves on the most current criteria in this field through lectures and personalized question solving.



“

*The strong background and solid knowledge base of the teacher team will be key to getting you off the ground in this career field"*

## Management



### Mr. Del Pino Luengo, Isatsi

- ♦ Airbus Defence & Space Certification and Airworthiness Technical Manager
- ♦ 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. Caballero Haro, Miguel

- ♦ Customer Success Manager for Slack/Salesforce
- ♦ Test Manager in Vodafone
- ♦ Test Manager in Apple Online Store
- ♦ SCRUM Product Owner by Scrum Alliance
- ♦ LeanSixSigma by Green belt Certificate
- ♦ Managing people effectively by Cork College of Commerce



# 04

# Structure and Content

This program will provide the students with a comprehensive overview of the most rigorous research in the field of Alternative Internal Combustion Engine Development. The academic program emphasizes the latest findings on the impact of artificial intelligence in this sector and the most advanced optimization strategies. Furthermore, graduates will be able to analyze all these aspects from a disruptive virtual campus that integrates cutting-edge multimedia resources such as explanatory videos, interactive summaries and infographics.





“

*This program provides several advantages, including innovative multimedia resources that complement learning”*

## Module 1. Research and development of new engine concepts

- 1.1. Evolution of Global Environmental Norms and Regulations
  - 1.1.1. Impact of International Environmental Regulations on the Engine Industry
  - 1.1.2. International Emission and Energy Efficiency Standards
  - 1.1.3. Regulation and Compliance
- 1.2. Research and Development in Advanced Engine Technologies
  - 1.2.1. Innovations in Engine Design and Technology
  - 1.2.2. Advances in Materials, Geometry and Manufacturing Processes
  - 1.2.3. Balance between Performance, Efficiency and Durability
- 1.3. Integration of Internal Combustion Engines in Propulsion and Electric Systems
  - 1.3.1. Integration of Internal Combustion Engines with Hybrid and Electric Systems
  - 1.3.2. Role of Engines in Battery Charging and Range Extension
  - 1.3.3. Control Strategies and Energy Management in Hybrid Systems
- 1.4. Transition to Electric Mobility and Other Propulsion Systems
  - 1.4.1. Shift from Traditional Propulsion to Electric and Other Alternatives
  - 1.4.2. The Different Propulsion Systems
  - 1.4.3. Infrastructure Needed for Electric Mobility
- 1.5. Economic and Commercial Prospects for Internal Combustion Engines
  - 1.5.1. Current and Future Economic Scenario for Internal Combustion Engines
  - 1.5.2. Market Demand and Consumption Trends
  - 1.5.3. Evaluation of the Impact of the Economic Perspective on I+D Investment
- 1.6. Development of Policies and Strategies to Promote Innovation in Engines
  - 1.6.1. Promotion of Innovation in Engines
  - 1.6.2. Incentives, Financing and Collaborations in the Development of New Technologies
  - 1.6.3. Success Stories in the Implementation of Innovation Policies



- 1.7. Sustainability and Environmental Aspects of Engine Design
  - 1.7.1. Sustainability in Engine Design
  - 1.7.2. Approaches to Reduce Emissions and Minimize Environmental Impact
  - 1.7.3. Eco-Efficiency in Terms of the Life Cycle of Engines
- 1.8. Engine Management Systems
  - 1.8.1. Emerging Trends in Motor Control and Management
  - 1.8.2. Artificial Intelligence, Machine Learning and Real-Time Optimization
  - 1.8.3. Analysis of the Impact of Advanced Systems on Performance and Efficiency
- 1.9. Internal Combustion Engines in Industrial and Stationary Applications
  - 1.9.1. Role of Combustion Engines in Industrial and Stationary Applications
  - 1.9.2. Use Cases in Power Generation, Industry and Freight Transportation
  - 1.9.3. Analysis of the Efficiency and Adaptability of Motors in Industrial and Stationary Applications
- 1.10. Research in Motor Technologies for Specific Sectors: Maritime, Aerospace
  - 1.10.1. Research and Development of Engines for Specific Industries
  - 1.10.2. Technical and Operational Challenges in Sectors such as Marine and Aerospace
  - 1.10.3. Analysis of the Impact of the Demands of These Sectors in Driving Innovation in Engines

“*Enroll in this Postgraduate Certificate and you will be able to acquire competencies through the disruptive and exclusive Relearning system”*

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 Alternative Internal Combustion Engines Research and Development guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate issued by TECH Global University.





“

*Successfully complete this 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 Research and Development** 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 Research and Development**

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.



Postgraduate Certificate  
Alternative Internal  
Combustion Engine  
Research and Development

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

# Postgraduate Certificate Alternative Internal Combustion Engines Research and Development