

# Postgraduate Certificate

## Alternative Internal Combustion Engine Optimization



## Postgraduate Certificate Alternative Internal Combustion Engine Optimization

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

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

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# 01

# Introduction

Alternative Internal Combustion Engines have had several advances in recent years, achieving high levels of efficiency and autonomy in large dimensions. Through them, engineers have succeeded in reducing the carbon footprint of automobiles and, in parallel, have pursued innovative lines of research such as electric or hybrid car machinery. Considering the boom in this field, it is imperative that professionals keep their skills up-to-date. For this reason, TECH has a program where engineers will expand their knowledge in a comprehensive way, through a disruptive 100% online methodology. In addition, the educational itinerary has exhaustive contents, varied multimedia resources and the most complete and prestigious teaching staff in the educational panorama.





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*You will gain a solid body of knowledge and skills throughout this comprehensive 6-week program”*

The purpose of integrating a combustion engine with an electric one and an energy recovery and storage system has proved to be very useful in reducing consumption and emissions, which ensures its validity for decades to come. Undoubtedly, combustion engines will evolve with the aim of coupling with the hybrid system and in this way, continue to develop and optimize their performance without losing fuel efficiency, durability and quality.

In this sense, studies in this area of knowledge have advanced with respect to innovation and development in the Internal Combustion sector, confirming that engineering experts must be at the forefront in this field of study, which is constantly changing on a daily basis. In this way, this educational program will provide the student with the best updates on heat losses and mechanical losses of combustion engines and their improvement points.

Students will broaden their skills in specific aspects related to the different optimization methods based on consumption and efficiency. On the other hand, it is a program that has a robust and experienced teaching staff and, therefore, is fully trained, supported by the highest quality multimedia content that offers a better student experience along with the convenience of the online modality.

In this way, TECH emphasizes excellence and time flexibility, providing the most complete update, as well as the highest standards, being a program of great comfort by only needing an electronic device with an Internet connection to access without difficulties to the Virtual Platform from the comfort of the place where you are.

This **Postgraduate Certificate in Alternative Internal Combustion Engine Optimization** 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 the self-assessment process 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



*Download the study materials for this program so you can analyze them whenever and wherever you want"*

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*This program will provide you with mastery of the major advances in thermal and volumetric optimization of MCIA's"*

*With TECH you will be able to update your practical skills in a comfortable, flexible and self-paced way thanks to its 100% online methodology.*

*Boost your career now with the best online university in the world according to Forbes.*

The program's teaching staff includes professionals from the sector who contribute their work experience to this training 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

The Postgraduate Certificate in Alternative Internal Combustion Engine Optimization has as its main objective to provide students with the tools and applications that allow them to measure the efficiency of these mechanical technologies. Throughout the program, engineers will update their theoretical and practical knowledge of thermal quality, emission control, electronic management and emission reduction methods. The purpose of this syllabus is to train professionals in an exhaustive way so that they can incorporate all the advances in the automotive industry into their daily practice.







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*Reach your goals and expand your professional practice with this course focused on the search for alternative low-polluting engines”*



## General Objectives

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- ♦ 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 alternative 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

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- Develop advanced concepts on which engine optimization is applied
- Analyze heat losses and mechanical losses of combustion engines and their improvement points
- Establish the different methods of optimization based on consumption and efficiency
- Evaluate performance optimization in internal combustion engines
- Review the main concepts of thermal and volumetric optimization
- Examine the different emission control methods
- Strengthen detection and electronic management methods
- Review the regulations applicable to gas emissions



*Study materials for this program will be available 24 hours a day, 7 days a week"*

03

# Course Management

TECH students will have access to an elite teaching staff throughout this university program. This faculty is made up of professionals with extensive experience in the automotive industry. Their experience includes research and development of mechanical technologies and innovative resources within the Alternative Internal Combustion Engines. In addition, their practical work in leading companies in the sector guarantees students the acquisition of cutting-edge skills and competencies, preparing them to face a variety of challenges in the real world.





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*This Postgraduate Certificate integrates a highly qualified and experienced teaching staff in the development of emission reduction technologies”*

## 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

This TECH program fully analyzes the determining factors when it comes to optimizing the design and creation of an Alternative Internal Combustion Engine. In particular, it delves into thermal efficiency, heat losses and mechanical deficiencies. It then addresses emission measurement, electronic management and control systems. In short, the university program provides an in-depth study of the practical applications implemented by the automotive industry to guarantee a quality product to customers and reduce its environmental impact. All this through a 100% online methodology, without tight schedules and the best teaching staff.





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*This Postgraduate Certificate guarantees you an exhaustive update for your professional practice. Enroll now!”*

## Module 1. Optimization: electronic management and emission control

- 1.1. Optimization of Alternative Internal Combustion Engines
  - 1.1.1. Power, Consumption and Thermal Efficiency
  - 1.1.2. Identification of Improvement Points: Heat and Mechanical Losses
  - 1.1.3. Optimization of Consumption and Thermal Efficiency
- 1.2. Heat and Mechanical Losses
  - 1.2.1. Parameterization and Sensing of Thermal and Mechanical Losses
  - 1.2.2. Cooling
  - 1.2.3. Lubrication and Oils
- 1.3. Measuring Systems
  - 1.3.1. Sensors
  - 1.3.2. Analysis of Results
  - 1.3.3. Practical Application: Analysis and Characterization of an Alternative Internal Combustion Engine
- 1.4. Thermal Performance Optimization
  - 1.4.1. Optimization of Engine Geometry: Combustion Chamber
  - 1.4.2. Fuels Injection and Control Systems
  - 1.4.3. Ignition Time Control
  - 1.4.4. Modification of the Compression Ratio
- 1.5. Volumetric Performance Optimization
  - 1.5.1. Overfeeding
  - 1.5.2. Modification of the Distribution Diagram
  - 1.5.3. Evacuation of Waste Gases
  - 1.5.4. Variable Admissions
- 1.6. Electronic Management of Internal Combustion Engines
  - 1.6.1. The Emergence of Electronics in the Combustion Control System
  - 1.6.2. Yield Optimization
  - 1.6.3. Applicability in Industry and Transportation
  - 1.6.4. Electronic Control in Alternative Internal Combustion Engines



- 1.7. Emission Control in Alternative Internal Combustion Engines
  - 1.7.1. Types of Emissions and Their Effects on the Environment
  - 1.7.2. Evolution of Applicable International Regulations
  - 1.7.3. Emission Reduction Technologies
- 1.8. Emissions Analysis and Measurement
  - 1.8.1. Emission Measurement Systems
  - 1.8.2. Emission Certification Tests
  - 1.8.3. Impact of Fuels and Design on Emissions
- 1.9. Catalytic Converters and Exhaust Gas Treatment Systems
  - 1.9.1. Types of Catalysts and Filters
  - 1.9.2. Exhaust Gas Recirculation
  - 1.9.3. Emission Control Systems
- 1.10. Alternative Emission Reduction Methods
  - 1.10.1. Use of Reciprocating Engine to Promote Emission Reduction
  - 1.10.2. Practical Application: Analysis of the City vs. Highway Driving Method of an Alternative Internal Combustion Engine
  - 1.10.3. Practical Application Analysis of Mass Transit and Carbon Footprint per Passenger



*Specialize in MCI optimization thanks to TECH's comprehensive virtual library and multimedia resources"*

05

# Methodology

This academic program offers students a different way of learning. Our methodology uses a cyclical learning approach: **Relearning**.

This teaching system is used, for example, in the most prestigious medical schools in the world, and major publications such as the **New England Journal of Medicine** have considered it to be one of the most effective.





*Discover Relearning, a system that abandons conventional linear learning, to take you through cyclical teaching systems: a way of learning that has proven to be extremely effective, especially in subjects that require memorization"*

## Case Study to contextualize all content

Our program offers a revolutionary approach to developing skills and knowledge. Our goal is to strengthen skills in a changing, competitive, and highly demanding environment.

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*At TECH, you will experience a learning methodology that is shaking the foundations of traditional universities around the world”*



*You will have access to a learning system based on repetition, with natural and progressive teaching throughout the entire syllabus.*



*The student will learn to solve complex situations in real business environments through collaborative activities and real cases.*

### A learning method that is different and innovative

This TECH program is an intensive educational program, created from scratch, which presents the most demanding challenges and decisions in this field, both nationally and internationally. This methodology promotes personal and professional growth, representing a significant step towards success. The case method, a technique that lays the foundation for this content, ensures that the most current economic, social and professional reality is taken into account.

“*Our program prepares you to face new challenges in uncertain environments and achieve success in your career”*

The case method is the most widely used learning system in the best faculties in the world. The case method was developed in 1912 so that law students would not only learn the law based on theoretical content. It consisted of presenting students with real-life, complex situations for them to make informed decisions and value judgments on how to resolve them. In 1924, Harvard adopted it as a standard teaching method.

What should a professional do in a given situation? This is the question that you are presented with in the case method, an action-oriented learning method. Throughout the program, the studies will be presented with multiple real cases. They will have to combine all their knowledge and research, and argue and defend their ideas and decisions.

## Relearning Methodology

TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines 8 different teaching elements in each lesson.

We enhance the Case Study with the best 100% online teaching method: Relearning.

*In 2019, we obtained the best learning results of all online universities in the world.*

At TECH, you will learn using a cutting-edge methodology designed to train the executives of the future. This method, at the forefront of international teaching, is called Relearning.

Our university is the only one in the world authorized to employ this successful method. In 2019, we managed to improve our students' overall satisfaction levels (teaching quality, quality of materials, course structure, objectives...) based on the best online university indicators.





In our program, learning is not a linear process, but rather a spiral (learn, unlearn, forget, and re-learn). Therefore, we combine each of these elements concentrically.

This methodology has trained more than 650,000 university graduates with unprecedented success in fields as diverse as biochemistry, genetics, surgery, international law, management skills, sports science, philosophy, law, engineering, journalism, history, and financial markets and instruments. All this in a highly demanding environment, where the students have a strong socio-economic profile and an average age of 43.5 years.

*Relearning will allow you to learn with less effort and better performance, involving you more in your training, developing a critical mindset, defending arguments, and contrasting opinions: a direct equation for success.*

From the latest scientific evidence in the field of neuroscience, not only do we know how to organize information, ideas, images and memories, but we know that the place and context where we have learned something is fundamental for us to be able to remember it and store it in the hippocampus, to retain it in our long-term memory.

In this way, and in what is called neurocognitive context-dependent e-learning, the different elements in our program are connected to the context where the individual carries out their professional activity.



This program offers the best educational material, prepared with professionals in mind:



### Study Material

All teaching material is produced by the specialists who teach the course, specifically for the course, so that the teaching content is highly specific and precise.

These contents are then applied to the audiovisual format, to create the TECH online working method. All this, with the latest techniques that offer high quality pieces in each and every one of the materials that are made available to the student.



### Classes

There is scientific evidence suggesting that observing third-party experts can be useful.

Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.



### Practising Skills and Abilities

They will carry out activities to develop specific skills and abilities in each subject area. Exercises and activities to acquire and develop the skills and abilities that a specialist needs to develop in the context of the globalization that we are experiencing.



### Additional Reading

Recent articles, consensus documents and international guidelines, among others. In TECH's virtual library, students will have access to everything they need to complete their course.





#### Case Studies

Students will complete a selection of the best case studies chosen specifically for this program. Cases that are presented, analyzed, and supervised by the best specialists in the world.



#### Interactive Summaries

The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

This exclusive educational system for presenting multimedia content was awarded by Microsoft as a "European Success Story".



#### Testing & Retesting

We periodically evaluate and re-evaluate students' knowledge throughout the program, through assessment and self-assessment activities and exercises, so that they can see how they are achieving their goals.



06

# Certificate

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





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

This **Postgraduate Certificate in Alternative Internal Combustion Engine Optimization** 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 diploma 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 Alternative Internal Combustion Engine Optimization**

Official N° of Hours: **150 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.

future  
health confidence people  
education information tutors  
guarantee accreditation teaching  
institutions technology learning  
community commitment  
personalized service innovation  
knowledge present  
development language  
virtual classroom



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