

Postgraduate Diploma Alternative Internal Combustion Engines



Postgraduate Diploma Alternative Internal Combustion Engines

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

Website: www.techtute.com/in/engineering/postgraduate-diploma/postgraduate-diploma-alternative-internal-combustion-engines

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01

Introduction

The reciprocating engine was created in Europe during the 18th century, first as an atmospheric engine, but later it was known as the steam engine. At that time, it was followed by the internal combustion engine in the 19th century, which is currently the most common and widely used mechanism. Over the years, processes have been perfected to make fuels as cleaner and more sustainable as possible, and at the same time, more economical in terms of their performance. Taking this into consideration, this 100% online TECH program will lead the graduate to enjoy the most complete learning about thermodynamic cycles in alternative internal combustion engines, mastering the most advanced construction techniques in this type of mechanisms.



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This Postgraduate Diploma will allow you to master the latest advances in design and construction of Alternative Internal Combustion Engines"

The main advantages of the use of Alternative Internal Combustion Engines are directly linked to the use of liquid fuels, generating exponential power and great autonomy, in addition to providing a long life to thermal engines. Accordingly, both small and large engines achieve efficiency in their use, since they have a wide range of powers allowing to move from a motorcycle to a transatlantic liner. In this sense, experts have been working on the innovation and improvement of these mechanisms, managing to carry out a wide variety of options in terms of minimizing pollution problems without sacrificing their autonomy and quality.

In this way, research and studies in this sector have advanced in areas such as the environment in the evolution of the construction of internal combustion engines, proving that engineers will be at the forefront of innovation in this area of knowledge. That is why this Postgraduate Diploma will provide the professional with the best updates in Alternative Internal Combustion Engines.

Students will expand their knowledge in detailed aspects related to the different injection and ignition methods in alternative internal combustion engines and the reduction of emissions in internal combustion vehicles. On the other hand, it is a program that integrates a faculty with extensive experience and fully specialized, along with an audiovisual material of the highest quality providing a better experience to the student in the academic process.

Therefore, TECH is focused on excellence, offering the most complete professional update and the highest standards, being a program of great flexibility as it only requires a device with an Internet connection to easily access the virtual platform from the comfort of the place where you are.

This **Postgraduate Diploma in Alternative Internal Combustion Engines** 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



Specialize in the area of Alternative Internal Combustion Engines thanks to TECH and be at the forefront of Mechanical Engineering"

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Expand your knowledge and become an engineer specialized in this field of knowledge with this very complete program"

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.

*Study with the most prestigious faculty.
Enroll now and enjoy an educational experience of the highest level.*

With TECH you will acquire the necessary skills to apply the different engine balancing techniques.



02

Objectives

This university program is especially focused on providing the professional with the most current innovations in this field of study. In this sense, TECH provides a variety of innovative teaching tools, thereby optimally and effectively implementing the program. At the end of this Postgraduate Diploma in Alternative Internal Combustion Engines, graduates will have developed their knowledge in the advantages of Otto cycle gasoline engines, measurement methods and control of tolerances during manufacturing.



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Do not hesitate and take the opportunity to specialize in the Alternative Internal Combustion Engines sector with this Postgraduate Diploma"



General Objectives

- ♦ Analyze the state of the art of Alternative ICE
- ♦ Identify conventional Alternative ICE
- ♦ Examine the different aspects to be taken into account in the life cycle of Alternative ICE
- ♦ 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), compact 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 (SPCCI), 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

Module 1. Alternative Internal Combustion Engines

- ♦ Analyze the thermodynamic cycles involved in the operation of Alternative ICE
- ♦ Concrete operation of conventional Alternative ICE such as Otto or Diesel cycle
- ♦ Establish the different existing performance terms
- ♦ Identify the elements that make up Alternative ICE

Module 2. Design, manufacture and simulation of Alternative ICE

- ♦ 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

Module 3. Vibration, noise and engine balancing

- ♦ Determine the vibration and noise modes generated by a reciprocating internal combustion engine
- ♦ Modal analysis of internal combustion engines, their dynamic response, frequency and torsional vibrations
- ♦ Establish the different techniques for balancing motors
- ♦ Develop the techniques used in noise and vibration control and reduction
- ♦ Identify maintenance tasks required to maintain levels within tolerances
- ♦ Support the impact of vibration and noise in industry and transportation, based on applicable international standards



Develop competencies in intake, compression, expansion and exhaust processes through 450 hours of the best theoretical and practical content"

03

Course Management

Through this Postgraduate Diploma, the student will have the opportunity to study with a teaching staff of great prestige in the area of Alternative Internal Combustion Engines. This is a unique option for specialization and professional updating that only TECH can offer you, by making available to you the latest advances in this field of Engineering. All this, together with the best multimedia resources and with a 100% online methodology of maximum academic rigor.



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With TECH you will benefit from an expert teaching staff of great prestige. Take advantage of the opportunity and enroll now"

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

Ms. Calatayud Sánchez, Rosa

- ♦ Type certificate Manager of the M&L fleet at Airbus DS
- ♦ Management of Certification activities with ADS areas and Authorities at Airbus DS
- ♦ Altran Innovation on behalf of Airbus DS for M&L programs Initial military version certification (FAR 25)
- ♦ Forming certification bases and type certificates for Airbus DS
- ♦ Certification and airworthiness trainer under Canadian TAA authority for Airbus DS
- ♦ Aeronautical Engineer, specializing in Aircraft and Airports, Polytechnic University of Valencia
- ♦ MBA at Tago Academy



A unique, key, and decisive educational experience to boost your professional development"

04

Structure and Content

This Postgraduate Diploma has been oriented to the professional according to the most recent studies in the field of Engineering, establishing a syllabus that provides a great content on Alternative Internal Combustion Engines. This program is designed to provide advanced knowledge of gas flow modeling, combustion and heat transfer. All this according to the series of audiovisual tools provided by TECH Technological University, which provide dynamism in the development of the educational program.

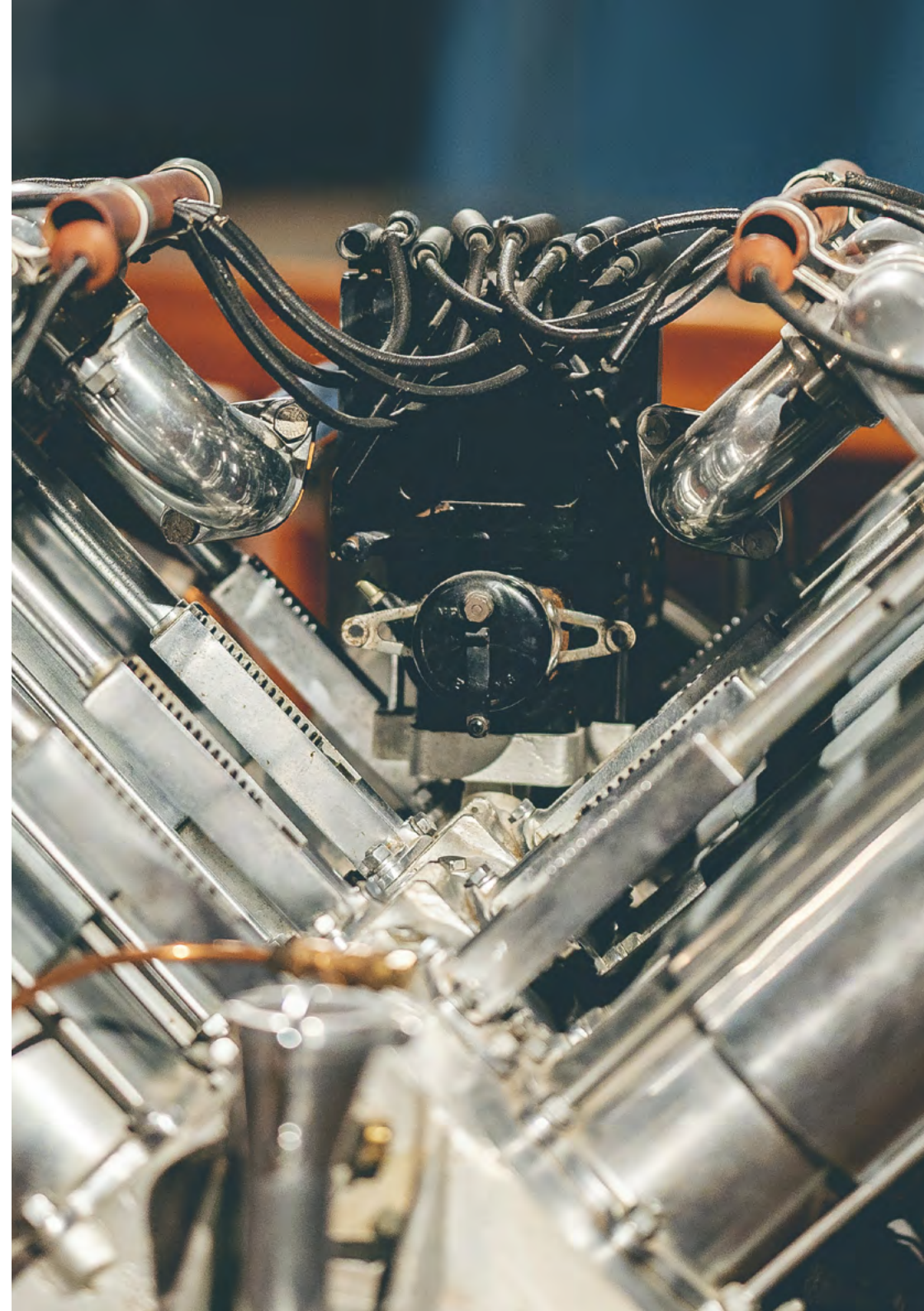


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In this program, TECH provides a syllabus focused on the Design, Fabrication and Simulation of Alternative ICE"

Module 1. Alternative Internal Combustion Engines

- 1.1. Alternative Internal Combustion Engines: State of the Art
 - 1.1.1. Alternative Internal Combustion Engines
 - 1.1.2. Innovation and Singularity: Distinctive Features of Alternative ICE
 - 1.1.3. Alternative ICE Classification Scheme
- 1.2. Thermodynamic Cycles in Reciprocating Internal Combustion Engines
 - 1.2.1. Parameters
 - 1.2.2. Duty Cycles
 - 1.2.3. Theoretical and Actual Cycles
- 1.3. Structure and Systems of Alternative Internal Combustion Engine Components
 - 1.3.1. Engine Block
 - 1.3.2. Carter
 - 1.3.3. Engine Systems
- 1.4. Combustion and Transmission in Reciprocating Internal Combustion Engine Components
 - 1.4.1. Cylinders
 - 1.4.2. Stock
 - 1.4.3. Crankshaft
- 1.5. Otto Cycle Gasoline Engines
 - 1.5.1. Gasoline Engine Operation
 - 1.5.2. Intake, Compression, Expansion and Exhaust Processes
 - 1.5.3. Advantages of Gasoline Otto Cycle Engines
- 1.6. Diesel Cycle Engines
 - 1.6.1. Diesel Cycle Engine Operation
 - 1.6.2. Combustion Process
 - 1.6.3. Benefits of Diesel Engines
- 1.7. Gas Engines
 - 1.7.1. Liquefied Petroleum Gas (LPG) Engines
 - 1.7.2. Compressed Natural Gas (CNG) Engines
 - 1.7.3. Gas Engine Applications
- 1.8. Bifuel and Flexfuel Engines
 - 1.8.1. Bifuel Engines
 - 1.8.2. Flexfuel Engines
 - 1.8.3. Bifuel and Flexfuel Engine Applications



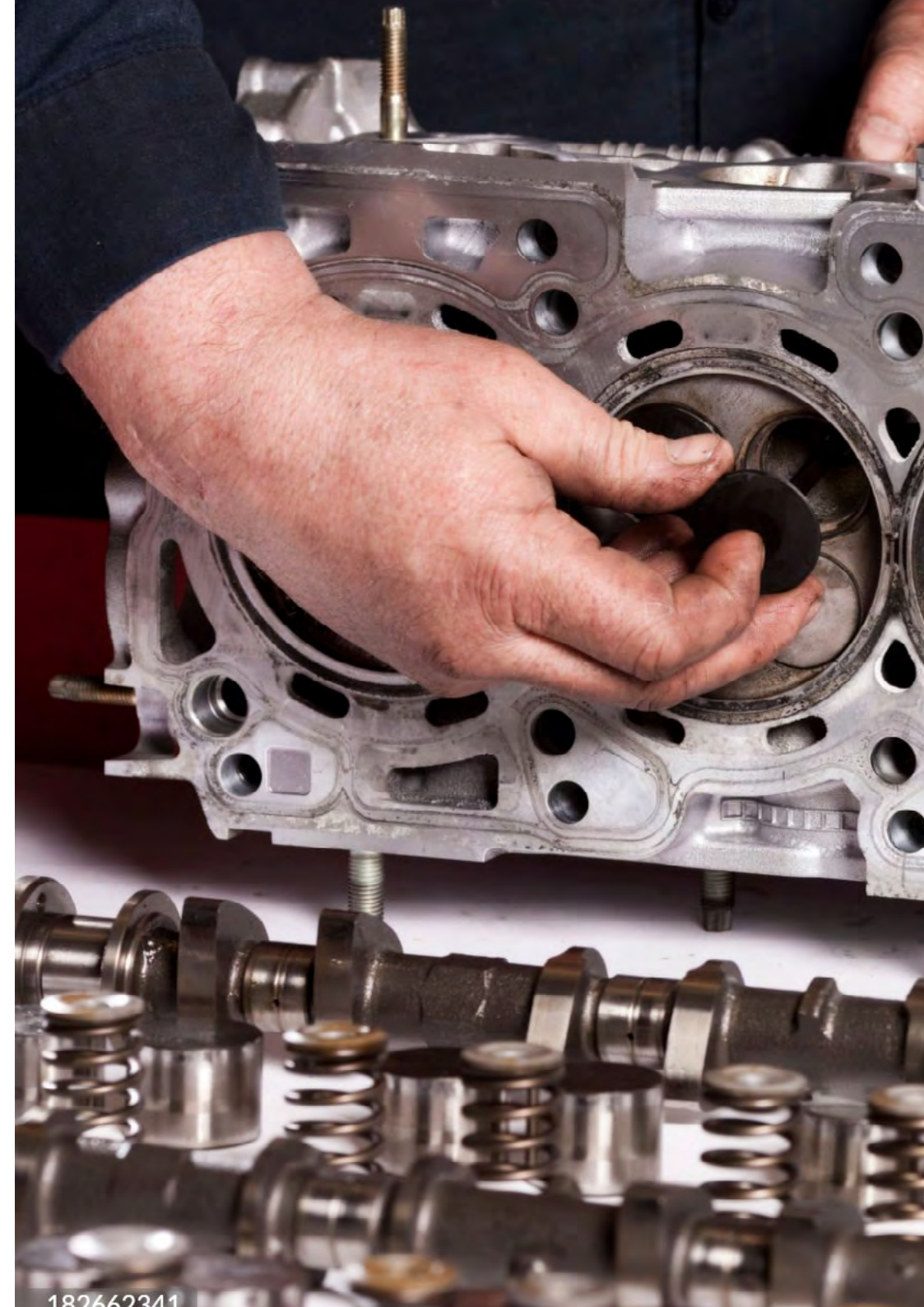
- 1.9. Other Conventional Engines
 - 1.9.1. Reciprocating Piston Rotary Engines
 - 1.9.2. Turbocharging Systems in Reciprocating Engines
 - 1.9.3. Rotary Engines and Turbocharging Systems Applications
- 1.10. Applicability of Alternative Internal Combustion Engines
 - 1.10.1. Alternative ICE in Industry and Transportation
 - 1.10.2. Applications in the Industry
 - 1.10.3. Transportation Applications
 - 1.10.4. Other Applications

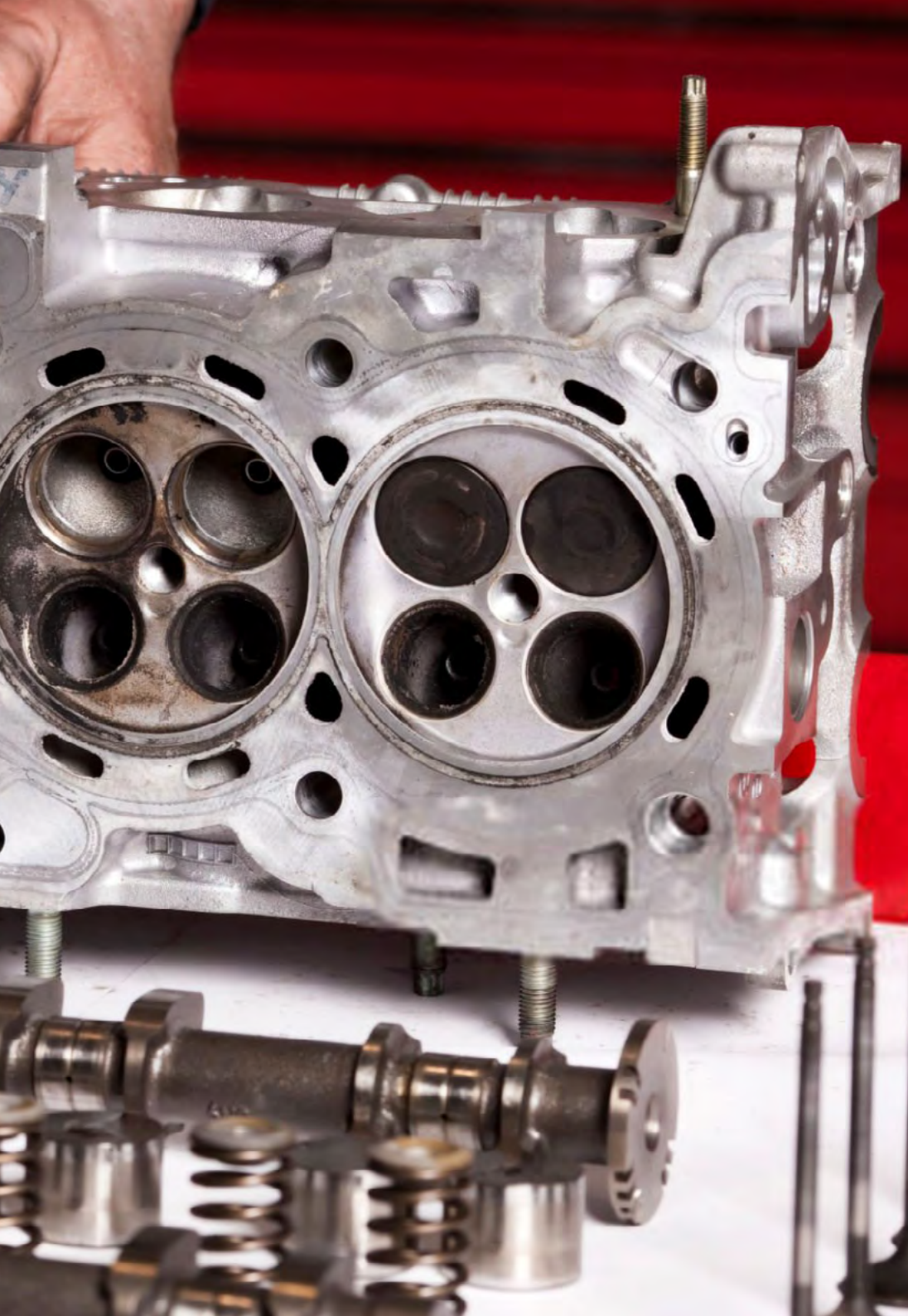
Module 2. Design, Manufacture and Simulation of Alternative ICE

- 2.1. Combustion Chamber Design
 - 2.1.1. Combustion Chamber Types
 - 2.1.1.1. Compact, Wedge-Shaped, Hemispherical
 - 2.1.2. Relationship between Chamber Shape and Combustion Efficiency
 - 2.1.3. Design Strategies
- 2.2. Materials and Fabrication Processes
 - 2.2.1. Material Selection for Critical Engine Components
 - 2.2.2. Mechanical, Thermal and Chemical Properties Required for Different Parts
 - 2.2.3. Manufacturing Processes
 - 2.2.3.1. Casting, Forging, Machining
 - 2.2.4. Strength, Durability and Weight in the Choice of Materials
- 2.3. Tolerances and Adjustments
 - 2.3.1. Motor Assembly and Operation Tolerances
 - 2.3.2. Adjustments to Prevent Leaks, Vibrations and Premature Wear and Tear
 - 2.3.3. Influence of Tolerances on Engine Efficiency and Performance
 - 2.3.4. Measuring Methods and Tolerance Control during Manufacture
- 2.4. Simulation and Modeling of Engines
 - 2.4.1. Use of Simulation Software to Analyze the Behavior of the Engine
 - 2.4.2. Gas Flow, Combustion and Heat Transfer Modeling
 - 2.4.3. Virtual Optimization of Design Parameters for Performance Improvement
 - 2.4.4. Correlation between Simulation Results and Experimental Tests
- 2.5. Engine Testing and Validation
 - 2.5.1. Test Design and Execution
 - 2.5.2. Verification of Simulation Results
 - 2.5.3. Iteration between Simulation and Testing
- 2.6. Test Benches
 - 2.6.1. Test Benches Function and Types
 - 2.6.2. Instrumentation and Measurements
 - 2.6.3. Interpretation of Results and Adjustments to the Design Based on the Tests
- 2.7. Design and Fabrication: Lubrication and Cooling System
 - 2.7.1. Functions of Lubrication and Cooling Systems
 - 2.7.2. Lubrication Circuit Design and Oil Selection
 - 2.7.3. Air and Liquid Cooling Systems
 - 2.7.3.1. Radiators, Pumps and Thermostats
 - 2.7.4. Maintenance and Monitoring to Prevent Overheating and Wear and Tear
- 2.8. Design and Fabrication: Distribution Systems and Valves
 - 2.8.1. Distribution Systems: Synchronization and Motor Efficiency
 - 2.8.2. Types of Systems and Their Manufacture
 - 2.8.2.1. Camshaft, Variable Valve Timing, Valve Drive
 - 2.8.3. Design of Cam Profiles to Optimize Valve Opening and Closing
 - 2.8.4. Design to avoid Interference and Improve Cylinder Filling
- 2.9. Design and Fabrication: Power, Ignition and Exhaust System
 - 2.9.1. Design of Fueling Systems to Optimize the Air-Fuel Mix
 - 2.9.2. Function and Design of Ignition Systems for Efficient Combustion
 - 2.9.3. Exhaust System Design to Improve Efficiency and Reduce Emissions
- 2.10. Practical Analysis of Engine Modeling
 - 2.10.1. Practical Application of Design and Simulation Concepts in a Case Study
 - 2.10.2. Modeling and Simulation of a Specific Engine
 - 2.10.3. Evaluation of Results and Comparison with Experimental Data
 - 2.10.4. Feedback to Improve Future Designs and Manufacturing Processes

Module 3. Vibration, Noise and Engine Balancing

- 3.1. Vibration and Noise on Internal Combustion Engines
 - 3.1.1. Evolution of Vibration and Noise Motors
 - 3.1.2. Vibration and Noise Parameters
 - 3.1.3. Data Acquisition and Interpretation
- 3.2. Sources of Vibration and Noise in Engines
 - 3.2.1. Vibration and Noise Generated by the Block
 - 3.2.2. Intake and Exhaust Generated Vibration and Noise
 - 3.2.3. Vibration and Noise Generated by Combustion
- 3.3. Modal Analysis and Dynamic Response of Motors
 - 3.3.1. Modal Analysis: Geometry, Materials and Configuration
 - 3.3.2. Modal Analysis Modeling: One Degree of Freedom/Multiple Degrees of Freedom
 - 3.3.3. Parameters: Frequency, Damping and Vibration Modes
- 3.4. Frequency and Torsional Vibration Analysis
 - 3.4.1. Amplitude and Frequency of Torsional Vibration
 - 3.4.2. Vibration Frequencies of Internal Combustion Engines
 - 3.4.3. Sensors and Data Acquisition
 - 3.4.4. Theoretical vs. Experimental Analysis
- 3.5. Engine Balancing Techniques
 - 3.5.1. In-Line Distribution Engine Balancing
 - 3.5.2. V-Distribution Engine Balancing
 - 3.5.3. Modeling and Balancing
- 3.6. Vibration Control and Reduction
 - 3.6.1. Control of Natural Vibration Frequencies
 - 3.6.2. Vibration and Shock Isolation
 - 3.6.3. Dynamic Damping
- 3.7. Noise Control and Reduction
 - 3.7.1. Noise Control and Attenuation Methods
 - 3.7.2. Exhaust Silencers
 - 3.7.3. Active Noise Cancellation Systems ANCS





- 3.8. Vibration and Noise Maintenance
 - 3.8.1. Lubrication
 - 3.8.2. Engine Block Balancing
 - 3.8.3. Useful Life of the Systems Dynamic Fatigue
- 3.9. Impact of Engine Vibration and Noise on Industry and Transportation
 - 3.9.1. International Standards in Industrial Plants
 - 3.9.2. International Regulations Applicable to Land Transportation
 - 3.9.3. International Regulations Applicable to Other Sectors
- 3.10. Practical Application of Vibration and Noise Analysis of an Internal Combustion Engine
 - 3.10.1. Theoretical Modal Analysis of an Internal Combustion Engine
 - 3.10.2. Determination of Sensors for Practical Analysis
 - 3.10.3. Establishment of Suitable Attenuation Methods and Maintenance Plan



With TECH you'll make it to the very top, thanks to the robust content offered by the Alternative Internal Combustion Engines program"

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.





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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.



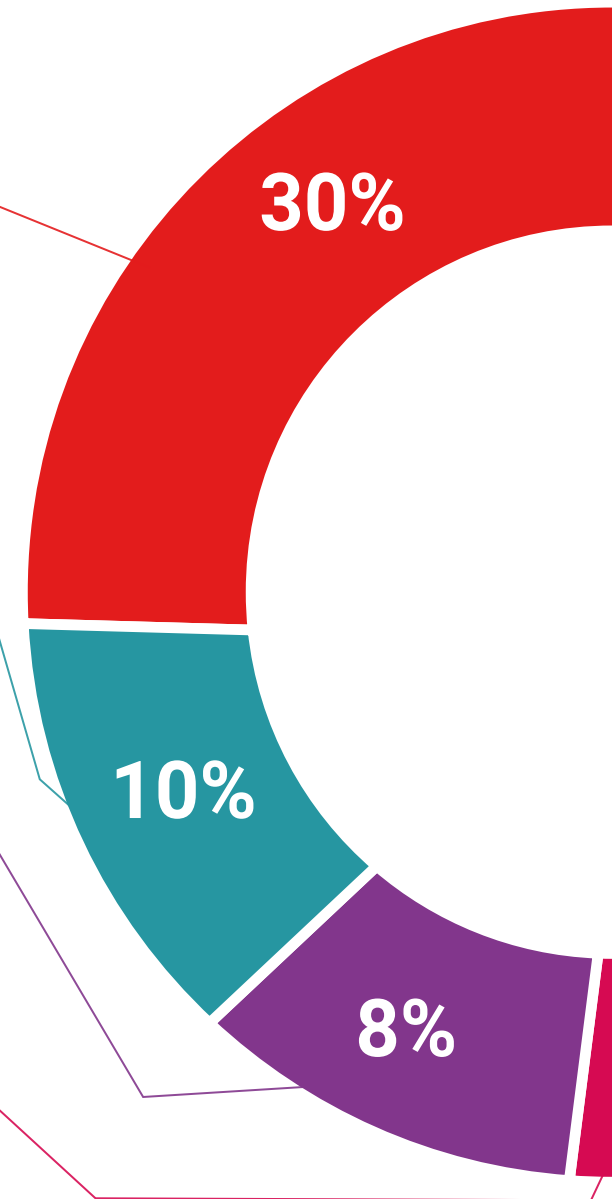
Practising Skills and Abilities

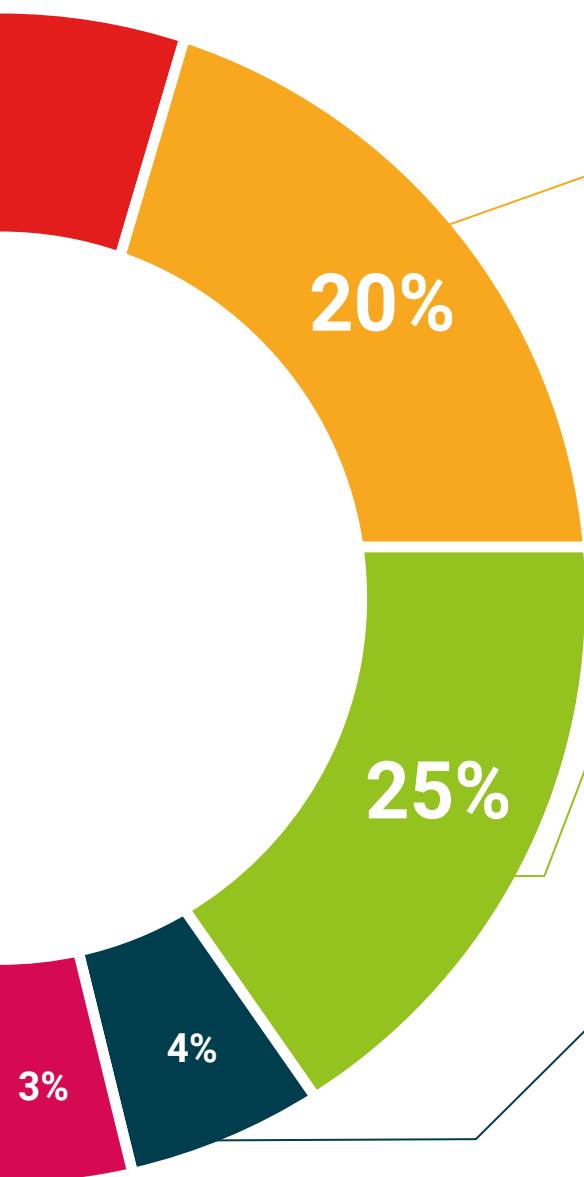
They will carry out activities to develop specific skills and abilities in each subject area. Exercises and activities to acquire and develop the skills and abilities that a specialist needs to develop in the context of the globalization that we are experiencing.



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 Diploma in Alternative 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 Diploma in Alternative 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 Diploma** issued by **TECH Technological University** via tracked delivery*.

The certificate 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 Alternative Internal Combustion Engines**

Official N° of Hours: **450 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.



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Postgraduate Diploma

Alternative Internal Combustion Engines