

# Postgraduate Certificate CFD Techniques for Predesign and Analysis



## Postgraduate Certificate CFD Techniques for Predesign and Analysis

- » 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/cfd-techniques-predesign-analysis](http://www.techtute.com/pk/engineering/postgraduate-certificate/cfd-techniques-predesign-analysis)

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Certificate

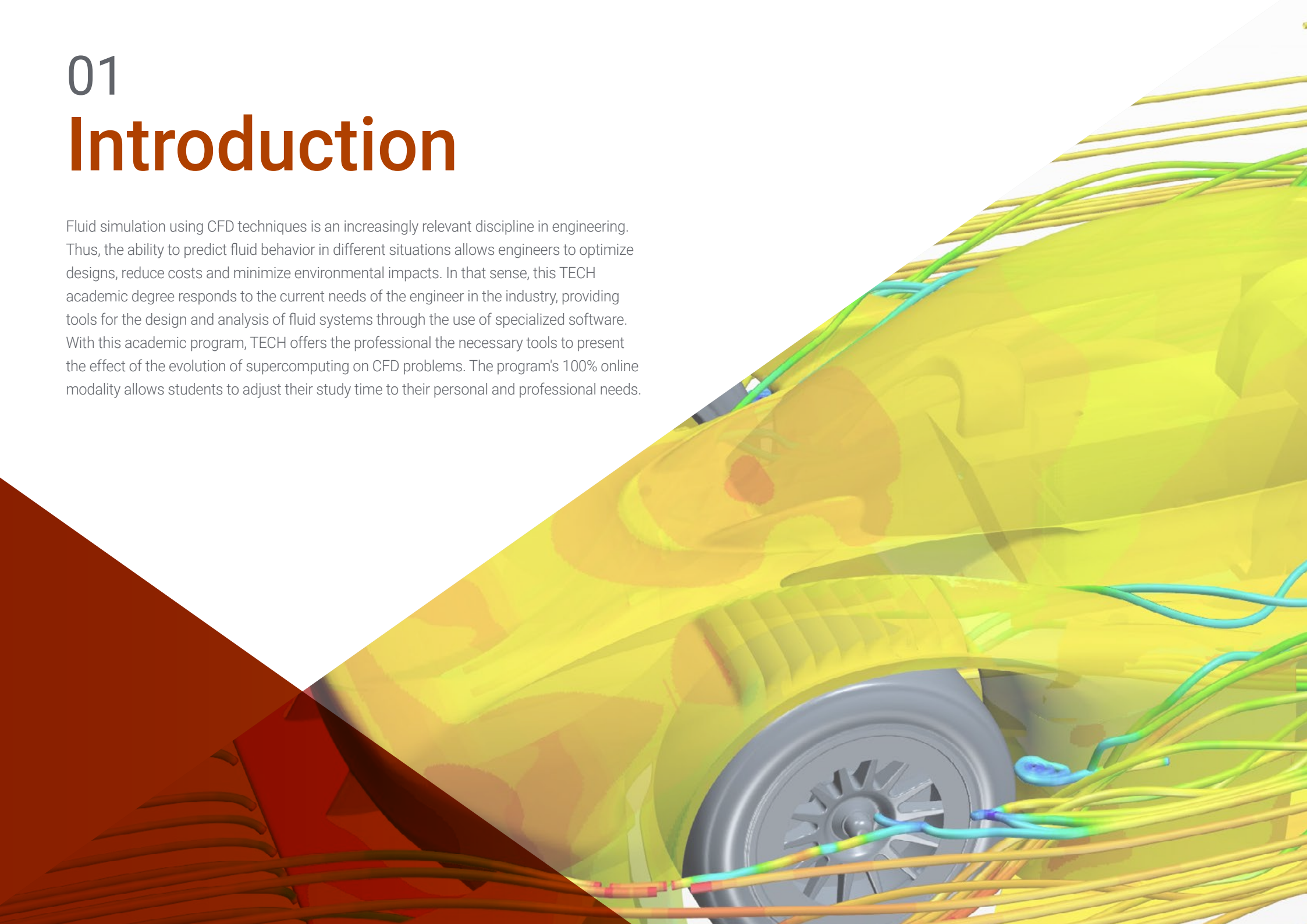
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# 01

# Introduction

Fluid simulation using CFD techniques is an increasingly relevant discipline in engineering. Thus, the ability to predict fluid behavior in different situations allows engineers to optimize designs, reduce costs and minimize environmental impacts. In that sense, this TECH academic degree responds to the current needs of the engineer in the industry, providing tools for the design and analysis of fluid systems through the use of specialized software. With this academic program, TECH offers the professional the necessary tools to present the effect of the evolution of supercomputing on CFD problems. The program's 100% online modality allows students to adjust their study time to their personal and professional needs.



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*With TECH's 100% online program, you will be able to study from anywhere and at any time, adjusting to your needs and schedules"*

CFD Techniques for Predesign and Analysis are fundamental tools for Computational Fluid Mechanics in the design of complex systems. Their use has become essential for a wide range of fields, from automotive to aerospace and energy engineering. With the growing demand for high quality products and increased competitiveness in the industry, it is essential that professionals are trained in the latest techniques and tools in the field.

It is in this context that TECH has developed a Postgraduate Certificate program in CFD Techniques for Predesign and Analysis that responds to the current needs of engineers in today's job market. In this way, the program offers comprehensive instruction in the use of advanced fluid simulation, modeling and analysis techniques, enabling professionals to improve efficiency, reduce costs and minimize environmental impacts. In addition, students will acquire specific skills in the selection and use of tools, as well as in obtaining coefficients and advanced time discretization methods.

This is an academic degree delivered in a 100% online format, which means that students can adapt their learning to their schedule and lifestyle. In addition, the teaching methodology used, Relearning, combines theory with practical exercises and complex simulated situations. In this way, students learn efficiently and dynamically, allowing them to integrate their knowledge in a natural and intuitive process.

This **Postgraduate Certificate in CFD Techniques for Predesign and Analysis** 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 Textile Engineering
- ◆ The graphic, schematic, and practical contents with which they are created, provide practical information on the 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 work
- ◆ Content that is accessible from any fixed or portable device with an Internet connection



*Gain deep insights into the boundary layers of aerodynamics with this TECH academic degree, created by top experts in the field"*

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*TECH's 100% online learning methodology will allow you to study at your own pace, without interrupting your professional work"*

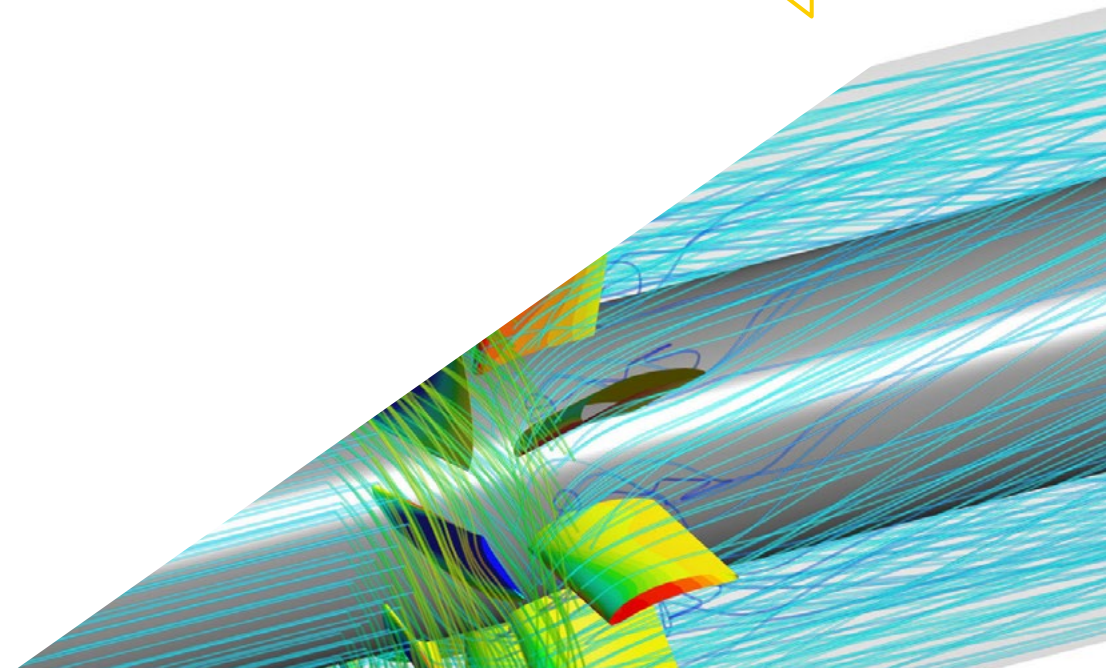
The program includes in its teaching staff professionals from the sector who bring to this program the experience of their work, as well as recognized specialists from leading societies and prestigious universities.

Its 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 an immersive education programmed to learn in real situations.

The design of this program focuses on Problem-Based Learning, by means of which the professional must try to solve the different professional practice situations that are presented throughout the academic course. This will be done with the help of an innovative system of interactive videos made by renowned experts.

*This Postgraduate Certificate has the most advanced multimedia resources in the educational market: detailed videos, case studies or interactive summaries, among many others.*

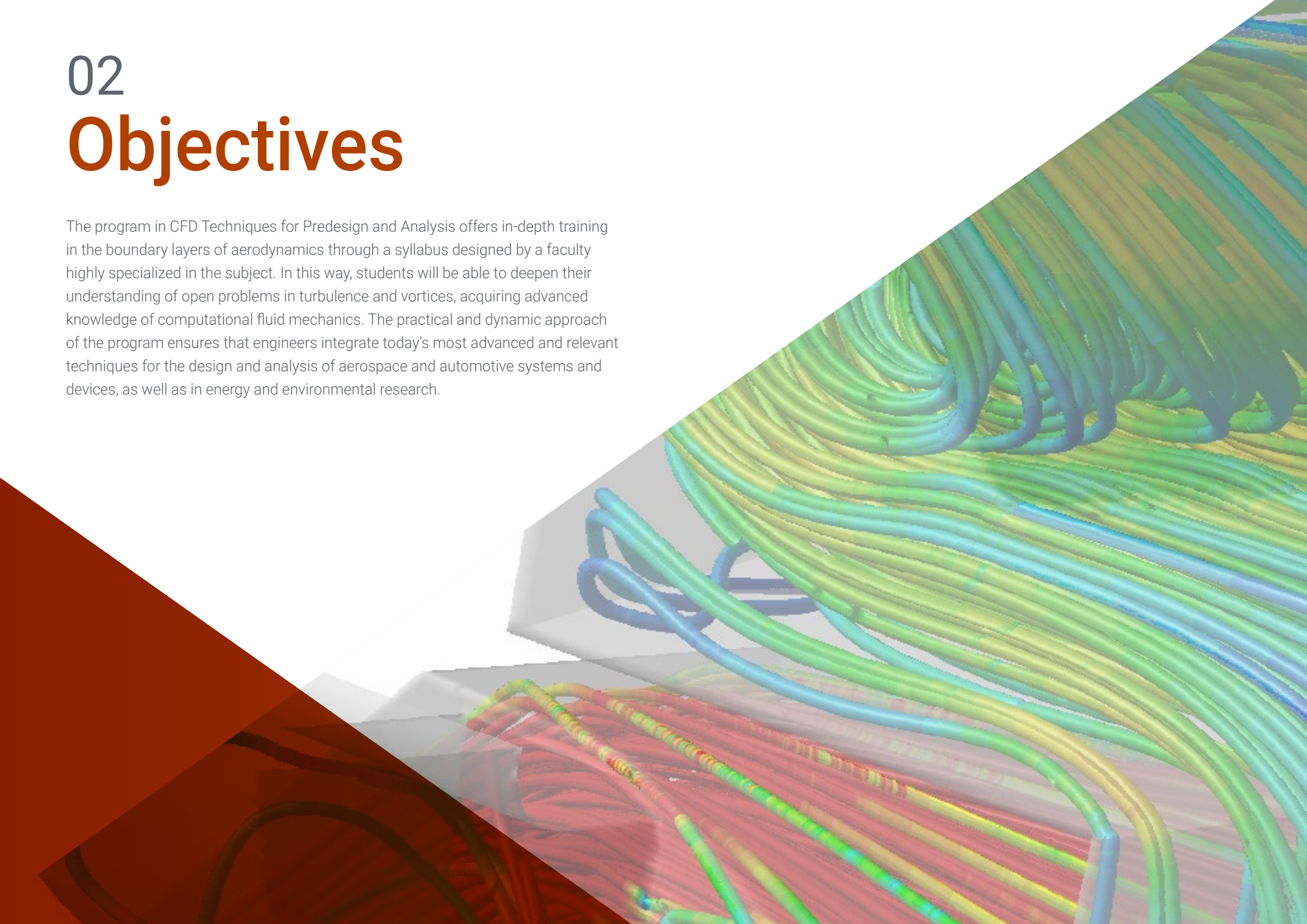
*Deepen your understanding of aspects such as turbulent structures through this TECH program and advance your career immediately.*



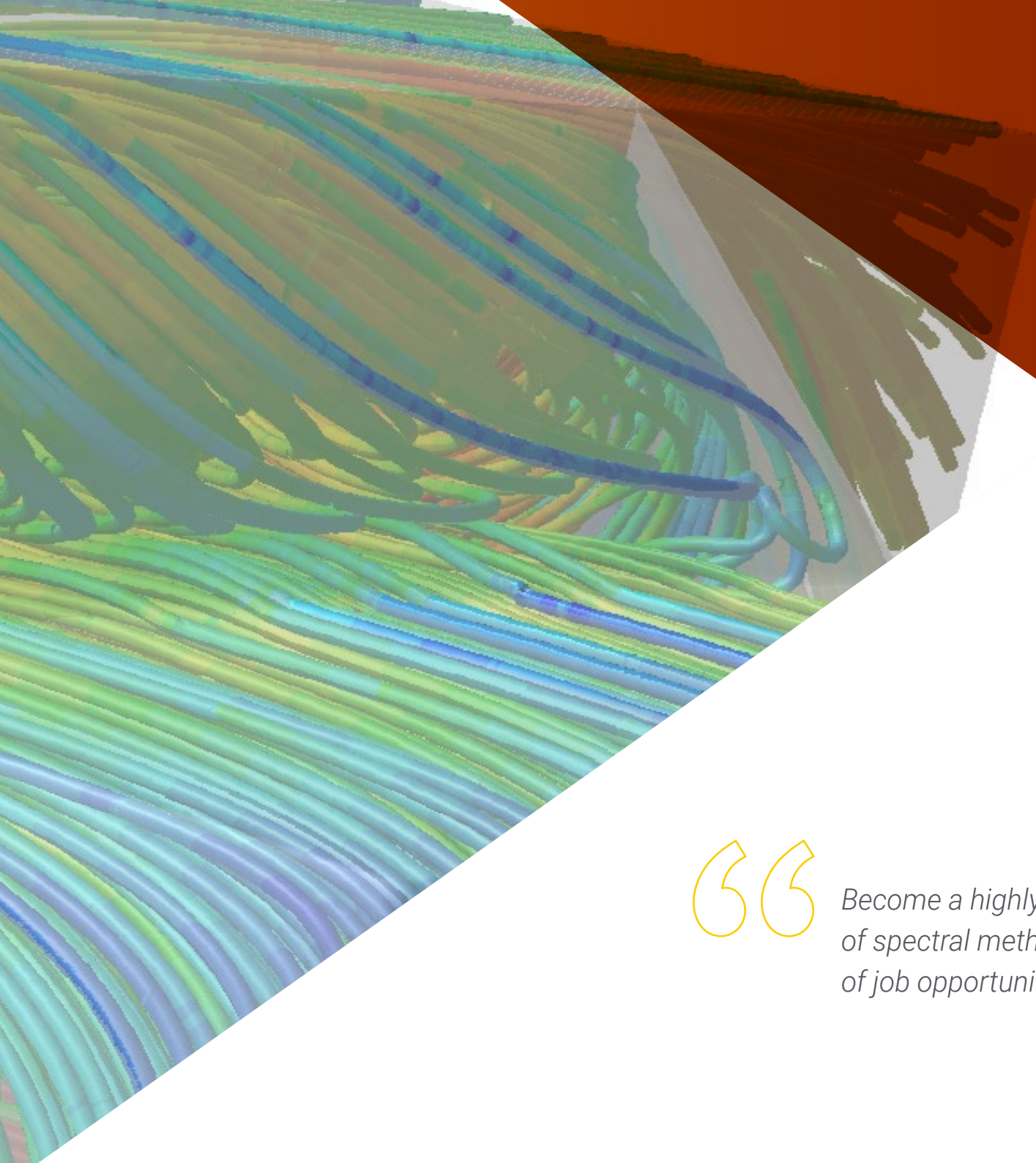
# 02

# Objectives

The program in CFD Techniques for Predesign and Analysis offers in-depth training in the boundary layers of aerodynamics through a syllabus designed by a faculty highly specialized in the subject. In this way, students will be able to deepen their understanding of open problems in turbulence and vortices, acquiring advanced knowledge of computational fluid mechanics. The practical and dynamic approach of the program ensures that engineers integrate today's most advanced and relevant techniques for the design and analysis of aerospace and automotive systems and devices, as well as in energy and environmental research.







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*Become a highly skilled professional in the mastery of spectral methods and gain access to a wide field of job opportunities in a constantly growing market”*



## General Objectives

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- ◆ Establish the basis for the study of turbulence
- ◆ Develop CFD statistical concepts
- ◆ Determine the main computational techniques in turbulence research
- ◆ Generate specialized knowledge in the method of Finite Volumes
- ◆ Acquire specialized knowledge in fluid mechanics calculation techniques
- ◆ Examine the wall units and the different regions of a turbulent wall flow
- ◆ Determine the characteristics of compressible flows
- ◆ Examine multiple models and multiphase methods
- ◆ Develop expertise on the multiple models and methods in multiphysics and thermal analysis
- ◆ Interpret the results obtained by correct post-processing





## Specific Objectives

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- ◆ Analyzing the future of artificial intelligence in turbulence
- ◆ Apply classical discretization methods to Fluid Mechanics problems
- ◆ Determine the different turbulent structures and their importance
- ◆ Show the method of characteristics
- ◆ To present the effect of the evolution of supercomputing on CFD problems
- ◆ Examine the main open problems in turbulence

“

*Get up to date in CFD and supercomputing and understand in depth the problem of memory and the evolution of computers thanks to the didactic tools provided by this Postgraduate Certificate”*

# 03

# Course Management

To ensure quality education, TECH has carefully selected a team of highly trained experts in the field of CFD Techniques for Pre-Design and Analysis. This teaching team has extensive experience in the area, ensuring that students have access to the most updated and innovative content in the field. The teaching methodology used, Relearning, is highly efficient and effective, which guarantees a comprehensive and practical understanding of the concepts.





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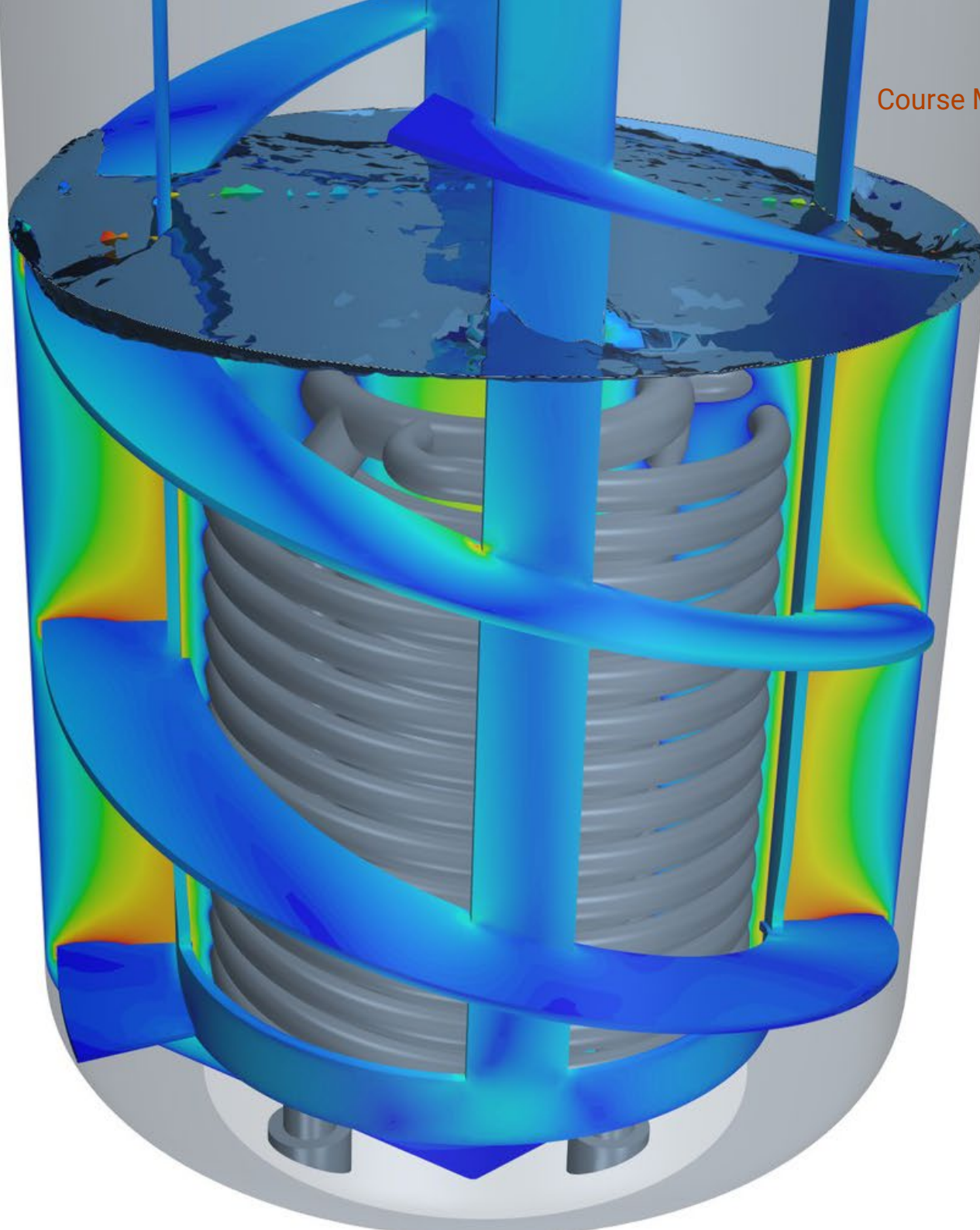
*Learn from the best. Deepen and train yourself in the use of biomedical imaging with the full support of TECH's professors”*

## Management



### **Dr. García Galache, José Pedro**

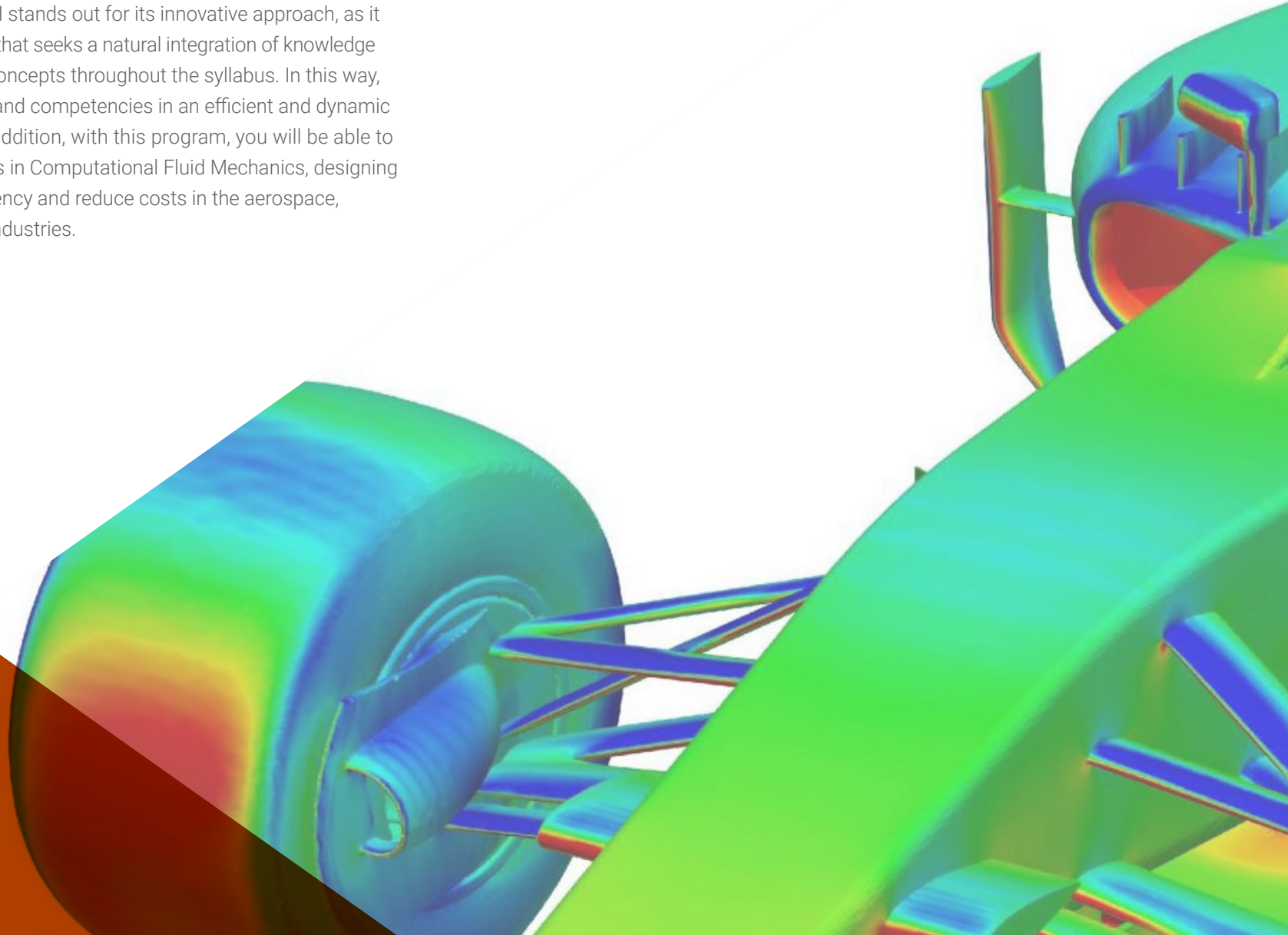
- ♦ XFlow Development Engineer at Dassault Systèmes
- ♦ PhD in Aeronautical Engineering from the Polytechnic University of Valencia
- ♦ Degree in Aeronautical Engineering from the Polytechnic University of Valencia
- ♦ Master's Degree in Research in Fluid Mechanics from the Von Kármán Institute for Fluid Dynamics
- ♦ Short Training Programme en el Von Kármán Institute for Fluid Dynamics



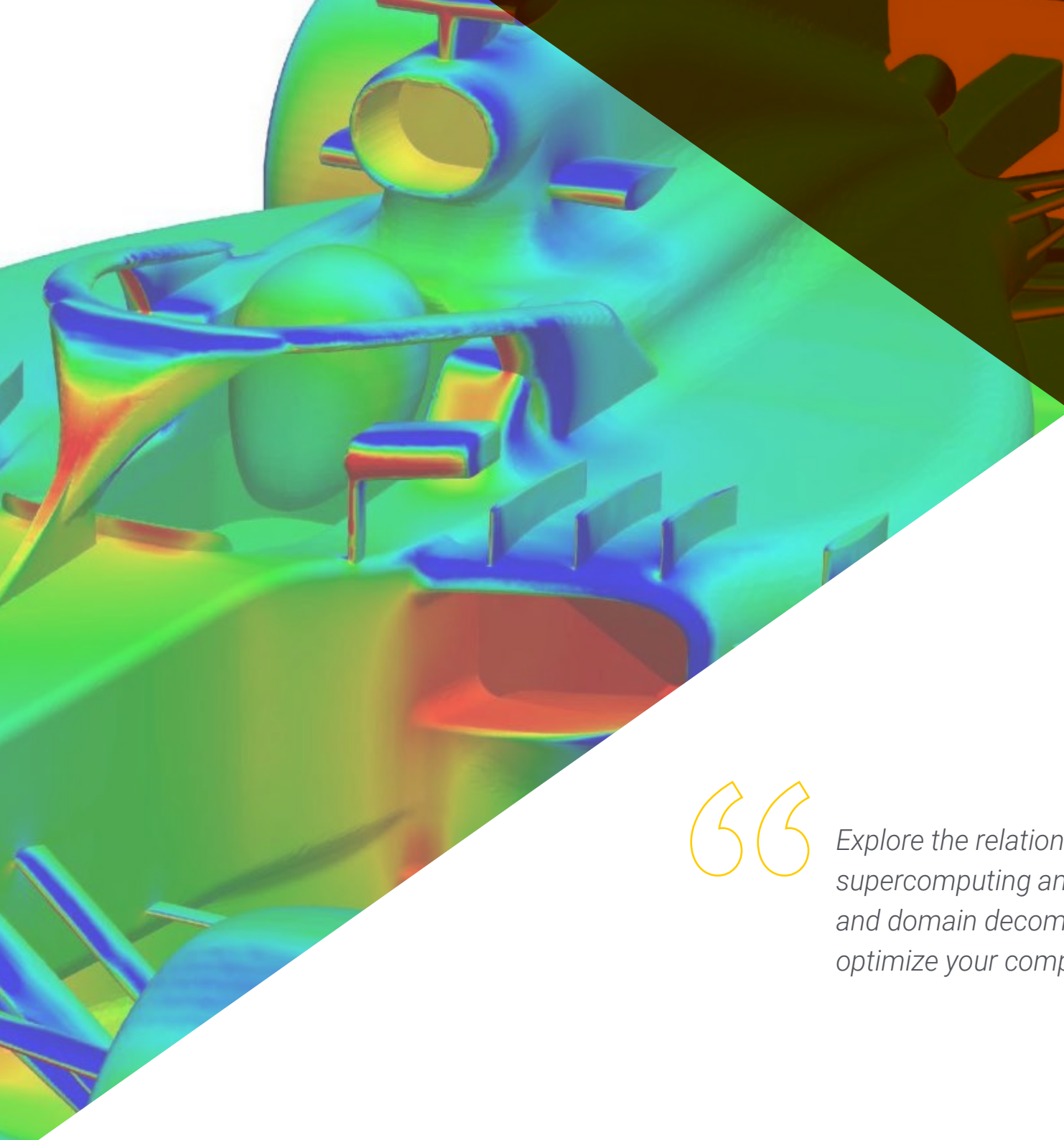
# 04

## Structure and Content

This academic program offered by TECH stands out for its innovative approach, as it is based on the Relearning methodology that seeks a natural integration of knowledge through the constant reiteration of key concepts throughout the syllabus. In this way, the student will be able to acquire skills and competencies in an efficient and dynamic way, without the need to memorize. In addition, with this program, you will be able to delve into the most advanced techniques in Computational Fluid Mechanics, designing and analyzing systems to improve efficiency and reduce costs in the aerospace, automotive, energy and environmental industries.







“

*Explore the relationship between CFD and supercomputing and discover parallelization and domain decomposition techniques to optimize your computations and analysis”*

## Module 1. CFD in Research and Modeling Environments

- 1.1. Research in Computational Fluid Dynamics (CFD)
  - 1.1.1. Challenges in turbulence
  - 1.1.2. Advances in Chronic Obstructive Pulmonary Disease
  - 1.1.3. Artificial Intelligence
- 1.2. Finite differences
  - 1.2.1. Presentation and application to a 1D problem. Taylor's Theorem
  - 1.2.2. 2D Applications
  - 1.2.3. Boundary Conditions
- 1.3. Compact finite differences
  - 1.3.1. Objective SK Lele's article
  - 1.3.2. Obtaining coefficients
  - 1.3.3. Application to a 1D problem
- 1.4. The Fourier Transform
  - 1.4.1. The Fourier transform. From Fourier to the present day
  - 1.4.2. The FFTW package
  - 1.4.3. Cosine transform: Tchebycheff
- 1.5. Spectral methods
  - 1.5.1. Application to a fluid problem
  - 1.5.2. Pseudo-spectral methods: Fourier + CFD
  - 1.5.3. Placement methods
- 1.6. Advanced time discretization methods
  - 1.6.1. The Adams-Bamsford method
  - 1.6.2. The Crack-Nicholson method
  - 1.6.3. Runge-Kutta
- 1.7. Structures in turbulence
  - 1.7.1. The vortex
  - 1.7.2. The life cycle of a turbulent structure
  - 1.7.3. Visualization Techniques



- 1.8. The Characteristics Method
  - 1.8.1. Compressible Fluids
  - 1.8.2. Application A breaking wave
  - 1.8.3. Application: Burguers equation
- 1.9. CFD and supercomputing
  - 1.9.1. The memory problem and the evolution of computers
  - 1.9.2. Parallelization techniques
  - 1.9.3. Domain decomposition
- 1.10. Open problems in turbulence
  - 1.10.1. Modeling and the VonKarma constant
  - 1.10.2. Aerodynamics: boundary layers
  - 1.10.3. Noise in CFD problems

“

*Delve into the latest advances in Computational Fluid Dynamics (CFD) and turbulence challenges in this TECH Postgraduate Certificate 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.





“

*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.



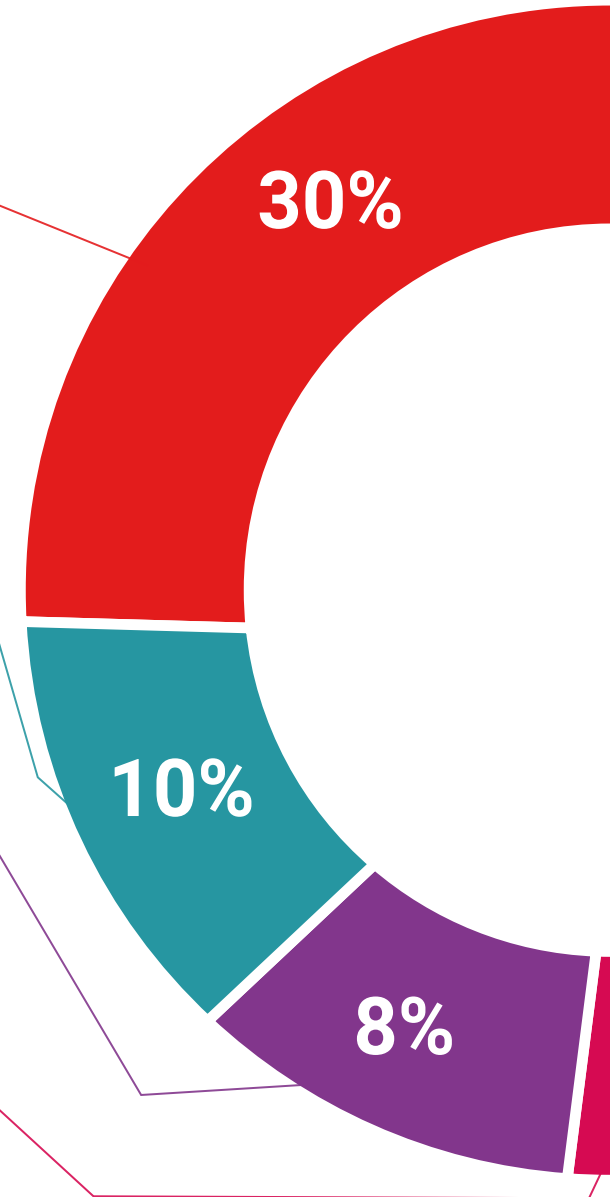
### Practising Skills and Abilities

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 CFD Techniques for Predesign and Analysis 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 CFD Techniques for Predesign and Analysis** 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 CFD Techniques for Predesign and Analysis**

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 language  
virtual classroom



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