Postgraduate Diploma
Fluid Mechanics

tech technological university

Postgraduate Diploma
Fluid Mechanics

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

Website: **www.techtitute.com/us/engineering/postgraduate-diploma/postgraduate-diploma-fluid-mechanics**

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01

Introduction

The advanced and applied knowledge of fluid mechanics has led to initiatives that contribute to reducing the impact of climate change and the scarcity of resources. Thus, energy is obtained through the simulation of sea waves or the design enhancement of more efficient vehicles. The aeronautics, automotive and hydraulic industries are working on projects along these lines and require highly qualified and decisive Engineers. For this reason, TECH offers the graduates an intensive 100% online program in which they will delve into classical mechanics and fluid physics. All this, in addition, with the Relearning method, which will allow you to progress through in a natural way and reduce the long hours of study.

Thanks to this Postgraduate Diploma in Fluid Mechanics, you will be able to advance with solid steps in your career in the hydraulics, aeronautics or automotive field"

Design of hydraulic turbines, structures, pollution control or improvement of internal combustion engines are just some of the direct applications of modern fluid mechanics, which was born thanks to Ludwig Prandtl in 1904. Since then, the development of this branch of physics has been widely exploited by different productive sectors such as aeronautics, oil hydraulics or industrial refrigeration.

Today, a solid and advanced knowledge of fluid physics is key to the development of new projects, some of them focused on favoring the environment or reducing the impact on the manufacturing environment. A scenario where companies demand highly qualified professionals, capable of putting into practice creative and innovative ideas, or simply being effective in solving problems. Faced with this reality, the graduates have this Postgraduate Diploma in Fluid Mechanics that offers, in just 6 months, advanced learning with multimedia content in line with current academic times.

Thus, by means of video summaries, videos in detail, essential readings, diagrams or case studies, students will learn about a syllabus that offers them, through a theoretical-practical approach, the key concepts of kinematics, relativistic analytical mechanics, classical field theory or the behavior of fluids under various conditions. All this, moreover, with the *Relearning* method, based on the reiteration of content, which will allow you to go through the syllabus in a much more natural way, reducing even the long hours of study so frequent in other teaching methods.

Thus, the engineering professionals can obtain a specialization with an online format and which can be accessed comfortable, whenever and wherever they wishes. All they need is an electronic device (computer, *tablet* or cell phone) with Internet connection to view the syllabus anytime. In addition, students have the possibility to distribute the course load according to their needs, which allows them to have more flexibility, ideal for professionals who wish to balance a Postgraduate Diploma with their work and/or personal responsibilities.

This **Postgraduate Diploma in Fluid Mechanics** contains the most complete and up-to-date program on the market. Its most outstanding features are:

- Practical case studies are presented by experts in Physics
- 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 electronic device with an Internet connection

An ideal educational option for professionals who wish to pursue a university program without compromising their work and personal responsibilities"

An extensive library of multimedia resources is available 24 hours a day to take you through rigid solid rotations, the inertia tensor and Euler's equations"

The case studies provided by the specialists in this program will give you the practical approach you need to advance your career as an Engineer.

In this program, you will learn about Lagrangian and Hamiltonian formulations and the limitations of Newtonian mechanics.

The program's teaching staff includes professionals from the sector who contribute their work experience to this educational program, as well as renowned 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 professionals must try to solve the different professional practice situations that are presented throughout the program. For this purpose, the student will be assisted by an innovative interactive video system created by renowned experts.

02
Objectives

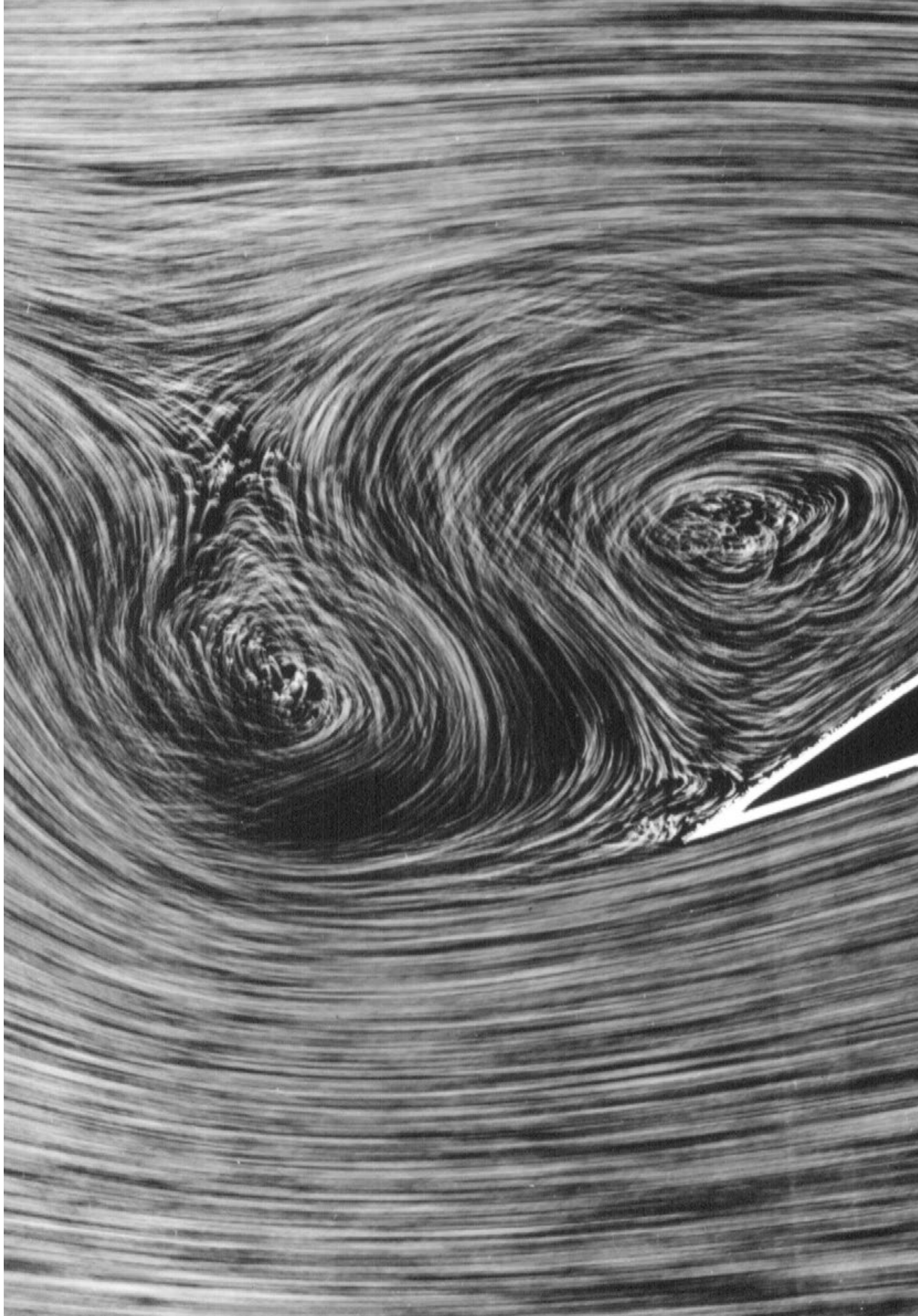
The engineering professional who wishes to prosper in various fields such as hydraulics must have a solid knowledge of Fluid Mechanics. That is why, upon completion of this program, they will have mastered classical mechanics, as well as the direct application of the behavior of fluids and the resolution of the different existing problems through Newton's, Lagrange's or Hamilton's formulism. The specialized faculty, which is part of this teaching will be in charge for guiding the students to the achievement of these goals.

Enroll now in a 100% online Postgraduate Diploma, which will take you to delve into analytical mechanics comfortably from your computer"

General Objectives

- Advance in Relativistic Dynamics
- Know the constitutive equations
- Be able to explain these behaviors using the basic equations of fluid dynamics
- Know how to solve classical mechanics problems using Newton's formulation as well as Lagrange's and Hamilton's

With this program, you will master differential analysis, the Navier-Stokes equations and their application in engineering projects. Enroll now"



Specific Objectives

Module 1. Classical Mechanics
- Solidify knowledge of Newtonian mechanics
- Solve central Forces problems using rotational symmetry
- Know how to deal with particle and rigid solid systems
- Study rigid solid rotations, the inertia tensor and Euler's equations

Module 2. Classical Mechanics II
- Know how to deal with particle systems and simple and coupled oscillators
- Understand and know how to use quadrivector mathematical tools
- Learn Lagrangian and Hamiltonian formalisms

Module 3. Fluid Mechanics
- Understand the general concepts of Fluid Physics and solve related problems
- Know the basic characteristics of fluids and their behavior under various conditions
- Acquire confidence in the handling of the Navier-Stokes equations

03
Structure and Content

The syllabus of this Postgraduate Diploma, designed by TECH, is structured in 3 modules, where students will be initially introduced to the basic concepts of classical mechanics, to later delve into symmetries and conservation laws, oscillations, relativistic analytical mechanics or classical field theory. Likewise, fluid mechanics will have great relevance in this program, so it will have a specific subject for it. The educational tools that you will be able to access 24 hours a day will provide greater dynamism to this 100% online program.

A syllabus that, in just 6 months, will allow you to learn from the key concepts of classical mechanics to current fluid mechanics"

Module 1. Classical Mechanics I

1.1. Kinematics and Dynamics: Review
 1.1.1. Newton's Law
 1.1.2. Reference Systems
 1.1.3. Motion Equation of Particles
 1.1.4. Conservation Theorems
 1.1.5. Particle System Dynamics
1.2. More Newtonian Mechanics
 1.2.1. Conservation Theorems for Particle Systems
 1.2.2. Universal Gravity Law
 1.2.3. Force Lines and Equipotential Surfaces
 1.2.4. Limitations of Newtonian Mechanics
1.3. Kinematics of Rotations
 1.3.1. Fundamentals of Mathematics
 1.3.2. Infinitesimal Rotations
 1.3.3. Angular Velocity and Acceleration
 1.3.4. Rotational Reference Systems
 1.3.5. Coriolis Force
1.4. Rigid Solid Study
 1.4.1. Rigid Solid Kinematics
 1.4.2. Inertia Tensor of Rigid Solids
 1.4.3. Main Inertia Axes
 1.4.4. Steiner and Perpendicular Axes Theorems
 1.4.5. Kinetic Energy of Rotation
 1.4.6. Angular Momentum
1.5. Symmetries and Conservation Laws
 1.5.1. Conservation Theorem of Linear Momentum
 1.5.2. Conservation Theorem of Angular Momentum
 1.5.3. Energy Conservation Theorem
 1.5.4. Classical Mechanic Symmetries: Galileo Group
1.6. Coordinate Systems: Euler Angles
 1.6.1. Coordinate Systems and Changes
 1.6.2. Euler Angles
 1.6.3. Euler Equations
 1.6.4. Stability Around a Major Axis
1.7. Rigid Solid Dynamics Applications
 1.7.1. Spherical Pendulum
 1.7.2. Free Symmetrical Top Movement
 1.7.3. Symmetrical Top Movement with a Fixed Point
 1.7.4. Gyroscopic Effect
1.8. Movement Under Central Forces
 1.8.1. Introduction to Central Force Fields
 1.8.2. Reduced Mass
 1.8.3. Trajectory Equation
 1.8.4. Central Field Orbits
 1.8.5. Centrifugal Energy and Effective Potential
1.9. Kepler's Problem
 1.9.1. Kepler's Problem
 1.9.2. Approximate Solution to Kepler's Equation
 1.9.3. Kepler's Laws
 1.9.4. Bertrand's Theorem
 1.9.5. Stability and Perturbation Theory
 1.9.6. 2-Body Problem
1.10. Collisions
 1.10.1. Elastic and Inelastic Shocks: Introduction
 1.10.2. Center of Mass Coordinate System
 1.10.3. Laboratory Coordinate System
 1.10.4. Elastic Shock Kinematics
 1.10.5. Particle Dispersion Rutherford's Dispersion Formula
 1.10.6. Effective Section

Module 2. Classical Mechanics II

- 2.1. Oscillations
  - 2.1.1. Simple Harmonic Oscillator
  - 2.1.2. Damped Oscillator
  - 2.1.3. Forced Oscillator
  - 2.1.4. Fourier Series
  - 2.1.5. Green's Function
  - 2.1.6. Non-Linear Oscillators
- 2.2. Coupled Oscillations I
  - 2.2.1. Introduction
  - 2.2.2. Coupling of Two Harmonic Oscillators
  - 2.2.3. Normal Trends
  - 2.2.4. Weak Coupling
  - 2.2.5. Forced Vibrations of Coupled Oscillators
- 2.3. Coupled Oscillations II
  - 2.3.1. General Theory of Coupled Oscillations
  - 2.3.2. Normal Coordinates
  - 2.3.3. Multiple Oscillator Coupling. Continuous Boundary and Vibrating Wire
  - 2.3.4. Wave Equation
- 2.4. Special Relativity Theory
  - 2.4.1. Inertial Reference Systems
  - 2.4.2. Galileo's Invariance
  - 2.4.3. Lorentz Transformations
  - 2.4.4. Relative Velocities
  - 2.4.5. Linear Relativistic Momentum
  - 2.4.6. Relativistic Invariants
- 2.5. Tensor Formalism of Special Relativity
  - 2.5.1. Quadrivectors
  - 2.5.2. Quadrimomentum and Quadriposition
  - 2.5.3. Relativistic Energy
  - 2.5.4. Relativistic Forces
  - 2.5.5. Relativistic Particle Collisions
  - 2.5.6. Particle Disintegrations
- 2.6. Introduction to Analytical Mechanics
  - 2.6.1. Links and Generalized Coordinates
  - 2.6.2. Mathematical Tools: Variance Calculation
  - 2.6.3. Definition of Action
  - 2.6.4. Hamilton Principle: Extreme Action
- 2.7. Lagrangian Formulation
  - 2.7.1. Lagrangian Definition
  - 2.7.2. Variance Calculation
  - 2.7.3. Euler-Lagrange Equations
  - 2.7.4. Conserved Quantities
  - 2.7.5. Extension to Non-Holonomous Systems
- 2.8. Hamiltonian Formulation
  - 2.8.1. Phasic Space
  - 2.8.2. Legendre Transformations: Hamiltonian
  - 2.8.3. Canonical Equations
  - 2.8.4. Conserved Quantities
- 2.9. Analytical Mechanics-Extension
  - 2.9.1. Poisson Parentheses
  - 2.9.2. Lagrange Multipliers and Bond Forces
  - 2.9.3. Liouville Theorem
  - 2.9.4. Virial Theorem
- 2.10. Analytical Relativistic Mechanics and Classical Field Theory
  - 2.10.1. Charge Movement in Electromagnetic Fields
  - 2.10.2. Lagrangian of a Free Relativistic Particle
  - 2.10.3. Interaction Lagrangian
  - 2.10.4. Classical Field Theory: Introduction
  - 2.10.5. Classical Electrodynamics

Module 3. Fluid Mechanics

3.1. Introduction to Fluid Physics
- 3.1.1. No-Slip Condition
- 3.1.2. Classification of Flows
- 3.1.3. Control System and Volume
- 3.1.4. Fluid Properties
- 3.1.4.1. Density
- 3.1.4.2. Specific Gravity
- 3.1.4.3. Vapor Pressure
- 3.1.4.4. Cavitation
- 3.1.4.5. Specific Heat
- 3.1.4.6. Compressibility
- 3.1.4.7. Speed of Sound
- 3.1.4.8. Viscosity
- 3.1.4.9. Surface Tension

3.2. Fluid Statics and Kinematics
- 3.2.1. Pressure
- 3.2.2. Pressure Measuring Devices
- 3.2.3. Hydrostatic Forces on Submerged Surfaces
- 3.2.4. Buoyancy, Stability and Motion of Rigid Solids
- 3.2.5. Lagrangian and Eulerian Description
- 3.2.6. Flow Patterns
- 3.2.7. Kinematic Tensors
- 3.2.8. Vorticity
- 3.2.9. Rotationality
- 3.2.10. Reynolds Transport Theorem

3.3. Bernoulli and Energy Equations
- 3.3.1. Conservation of Mass
- 3.3.2. Mechanical Energy and Efficiency
- 3.3.3. Bernoulli's Equation
- 3.3.4. General Energy Equation
- 3.3.5. Stationary Flow Energy Analysis

3.4. Fluid Analysis
- 3.4.1. Conservation of Linear Momentum Equations
- 3.4.2. Conservation of Angular Momentum Equations
- 3.4.3. Dimensional Homogeneity
- 3.4.4. Variable Repetition Method
- 3.4.5. Buckingham's Pi Theorem

3.5. Flow in Pipes
- 3.5.1. Laminar and Turbulent Flow
- 3.5.2. Inlet Region
- 3.5.3. Minor Losses
- 3.5.4. Networks

3.6. Differential Analysis and Navier-Stokes Equations
- 3.6.1. Conservation of Mass
- 3.6.2. Current Function
- 3.6.3. Cauchy Equation
- 3.6.4. Navier-Stokes Equation
- 3.6.5. Dimensionless Navier-Stokes Equations of Motion
- 3.6.6. Stokes Flow
- 3.6.7. Inviscid Flow
- 3.6.8. Irrotational Flow
- 3.6.9. Boundary Layer Theory. Clausius Equation

3.7. External Flow
- 3.7.1. Drag and Lift
- 3.7.2. Friction and Pressure
- 3.7.3. Coefficients
- 3.7.4. Cylinders and Spheres
- 3.7.5. Aerodynamic Profiles

3.8. Compressible Flow
- 3.8.1. Stagnation Properties
- 3.8.2. One-Dimensional Isentropic Flow
- 3.8.3. Nozzles
- 3.8.4. Shock Waves
- 3.8.5. Expansion Waves
- 3.8.6. Rayleigh Flow
- 3.8.7. Fanno Flow

3.9. Open Channel Flow
- 3.9.1. Classification
- 3.9.2. Froude Number
- 3.9.3. Wave Speed
- 3.9.4. Uniform Flow
- 3.9.5. Gradually Varying Flow
- 3.9.6. Rapidly Varying Flow
- 3.9.7. Hydraulic Jump

3.10. Non-Newtonian Fluids
- 3.10.1. Standard Flows
- 3.10.2. Material Functions
- 3.10.3. Experiments
- 3.10.4. Generalized Newtonian Fluid Model
- 3.10.5. Generalized Linear Viscoelastic Generalized Viscoelastic Fluid Model
- 3.10.6. Advanced Constitutive Equations and Rheometry

“A program that will allow you to delve into fluid mechanics through video summaries, detailed videos or readings”

04

Methodology

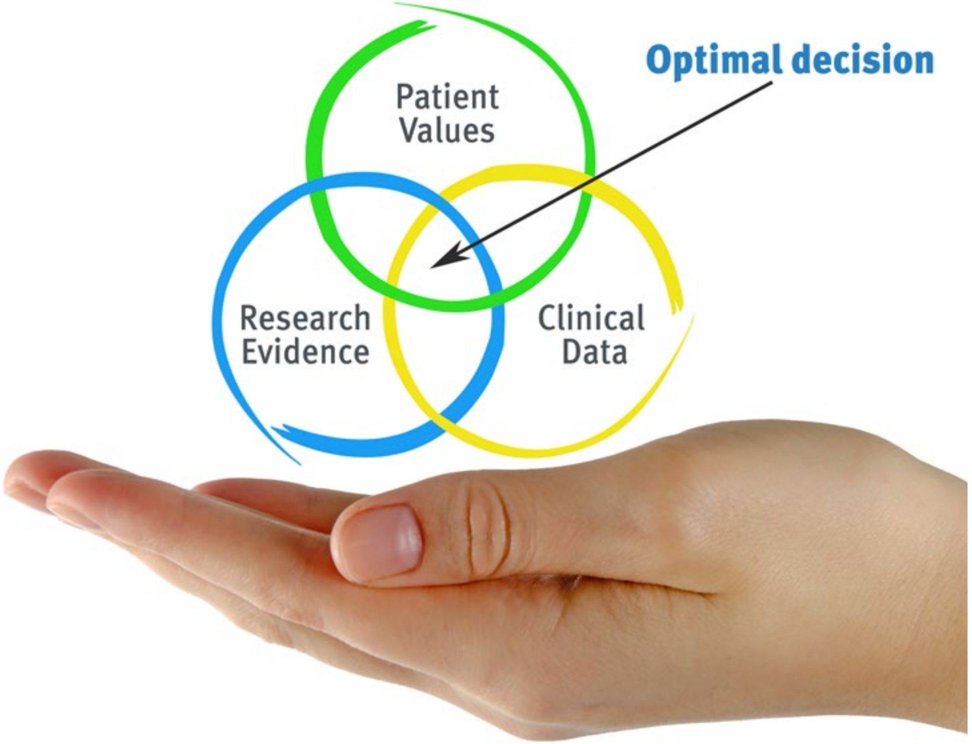
This academic program offers students a different way of learning. Our methodology uses a cyclical learning approach: **Relearning.**
This teaching system is used, for example, in the most prestigious medical schools in the world, and major publications such as the **New England Journal of Medicine** 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

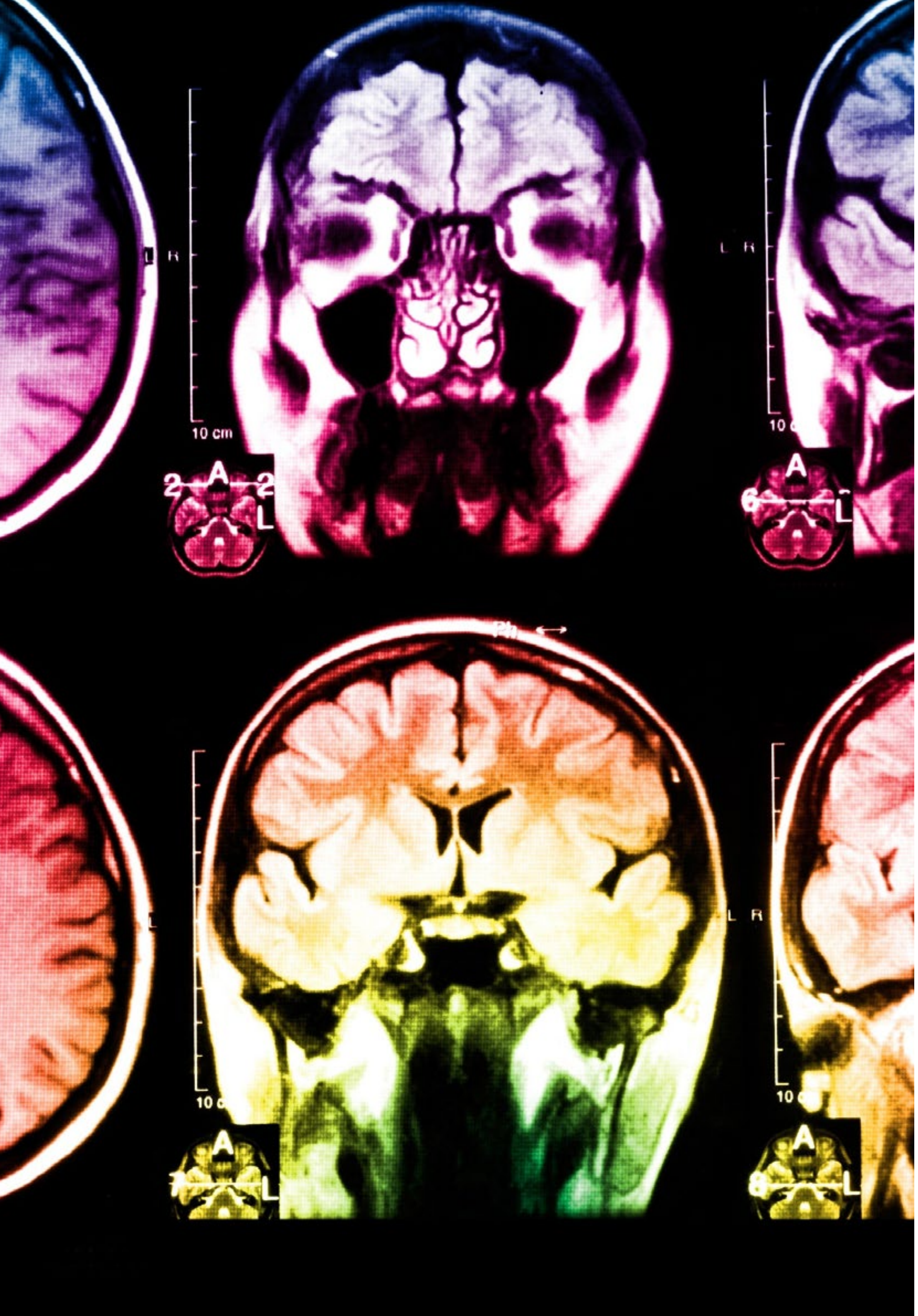
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines 8 different teaching elements in each lesson.

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.

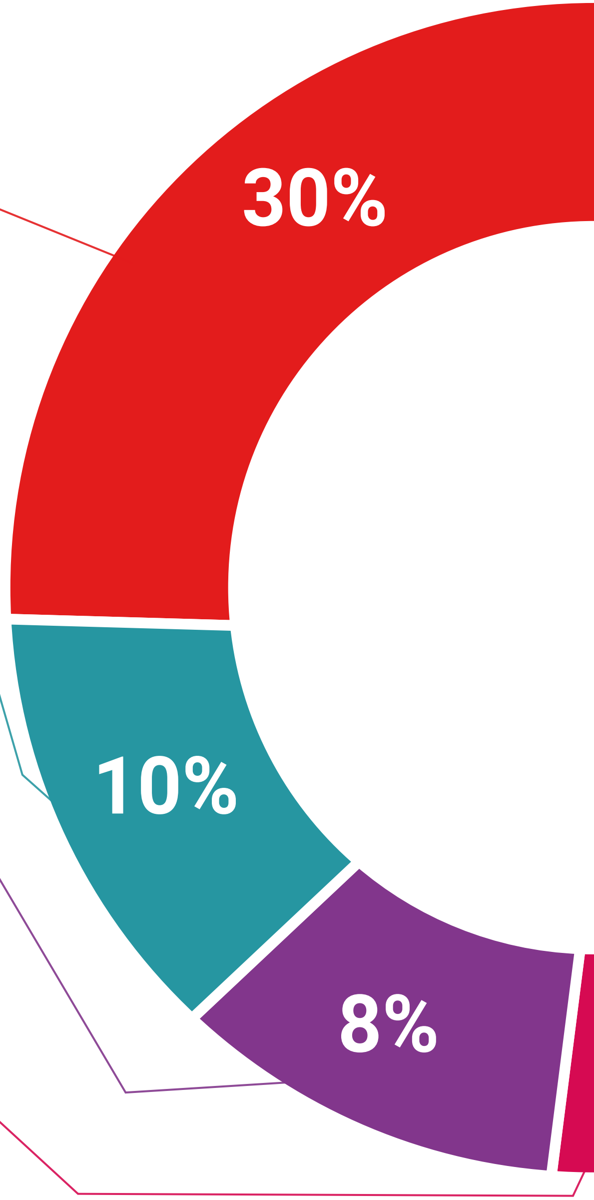
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

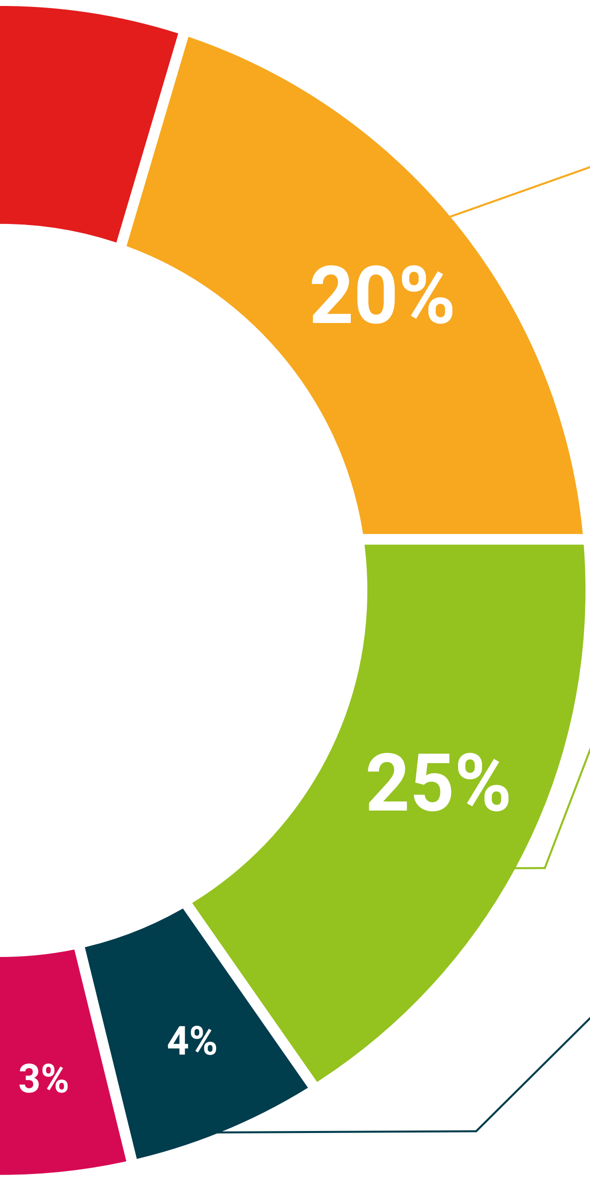
Practising Skills and Abilities

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.

Certificate

The Postgraduate Diploma in Fluid Mechanics guarantee s students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Diploma issued by TECH Technological University.

Successfully complete this program and receive your Postgraduate Certificate without having to travel or fill out laborious paperwork"

This **Postgraduate Diploma in Fluid Mechanics** contains the most complete and up-to-date educational 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 diploma 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.

Certificate: **Postgraduate Diploma in Fluid Mechanics**

Official No. of Hours: **450 h.**


tech technological university

Awards the following

DIPLOMA

to

Mr./Ms. _______________, with identification number ___________.
For having passed and accredited the following program

POSTGRADUATE CERTIFICATE

in

Fluid Mechanics

This is a qualification awarded by this University, equivalent to 150 hours, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

TECH is a Private Institution of Higher Education recognized by the Ministry of Public Education as of June 28, 2018.

June 17, 2020

Tere Guevara Navarro
Dean

Unique TECH Code: AFWORD23S techtitute.com/certificates

*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.

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- Schedule: **at your own pace**
- Exams: **online**

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