# Postgraduate Diploma
## Geophysics

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# Postgraduate Diploma
## Geophysics

- 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-geophysics

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01

# Introduction

The scarcity of natural resources, the search for alternative materials or the prevention of different risks caused by natural phenomena have boosted the demand for engineering professionals with a solid knowledge of geophysics. Thus, both the public and private sectors are promoting initiatives and projects in this field that require a high level of qualification. This is why this 100% online program was created, which will allow the graduate, in only 6 months, to acquire intensive and advanced learning on the physics of materials, fluid mechanics and the most important concepts in the field of Geophysics. All this, moreover, through content prepared by specialists and which you can easily access, at any time of the day, from a computer with Internet connection.

*Thanks to this Postgraduate Diploma, you will be able to create engineering projects that detect natural risks"*

Scientific studies and advances in the field of Geophysics are allowing us to learn even more about the Earth, its resources and its multiple possibilities. At the same time, this knowledge is used to search for new natural resources, in view of the scarcity of others such as water, or the creation of new methods for the evaluation of possible environmental risks.

In this scenario, engineering becomes fundamental given its technical knowledge and the skills of professionals who, with extensive knowledge in Geophysics, can contribute to the creation of new technological equipment or promote projects that favor the current lines of work. In view of this, TECH has created a program that will provide you with the necessary knowledge to boost your career in this field.

Thus, throughout the 6 months of duration of this Postgraduate Diploma, the specialist will acquire advanced learning about the internal structure of the Earth, earthquakes, the most relevant experimental techniques to solve problems in environmental sciences or the key concepts of fluid mechanics. Intensive knowledge, which will be much easier to achieve thanks to the multimedia resources provided by this academic institution.

A university education that does not require attendance, nor does it have classes with fixed schedules, making it an ideal academic option for those who wish to combine a Postgraduate Diploma with the most demanding responsibilities. Students only need an electronic device with an Internet connection to be able to visualize, at any time, the syllabus hosted on the virtual platform. In addition, with the Relearning system, based on content reiteration, they will be able to reduce the long hours of study.

This **Postgraduate Diploma in Geophysics** contains the most complete and up-to-date educational program on the market. The most important features include:

- 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 device with an Internet connection

*A 100% online program that will allow you to reduce the long hours of study with the Relearning system. Enroll now”*

*You will be able to deepen your knowledge 24 hours a day, from any computer with an internet connection, on the main magnetically soft and hard materials of technological interest"*

*The case studies provided by the specialists of this program will show you methodologies and concepts that can be integrated in your daily practice.*

*Have access to the most advanced knowledge on fluid mechanics and its transcendence in engineering projects. Enroll now.*

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 academic year For this purpose, the student will be assisted by an innovative interactive video system created by renowned and experienced experts.

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# Objectives

TECH has designed this university program with the main objective of providing the necessary knowledge to boost the career path of the engineers attending it. For this purpose, it provides the most recent teaching tools, which will lead you to master the key concepts of Geophysics, to apply environmental sciences to the current technology and to understand the basic characteristics of fluids. The specialized teaching team will guide students to achieve these goals.

*A program that will help you to have the most advanced concepts to be able to use the most effective methods in resource search"*

## General Objectives

- Apply key environmental science concepts to current technology
- Understand and solve fluid physics problems
- Detect the seismic wave generation and propagation
- Understand the more complex crystal structures (ionic and covalent)

*This degree will lead you to master the Navier-Stokes equations and the constitutive equations"*



## Specific Objectives

### Module 1. Geophysics

- Apply the principles of physics to the study of the Earth
- Understand the fundamental physical processes of the Earth
- Understand the basic techniques for studying the physical properties, structure, and dynamics of the Earth
- Identify methods of searching for resources and assessing and mitigating natural hazards

### Module 2. Material Physics

- Know the relationship between Material Science and Physics, and the applicability of this science in today's technology
- Understanding the connection between the microscopic structure (atomic, nanometric or micrometric) and the macroscopic properties of materials, as well as their interpretation in physical terms
- Know the most relevant experimental techniques and be able to discern their use to solve a problem in Materials Science
- Master the multiple properties of materials

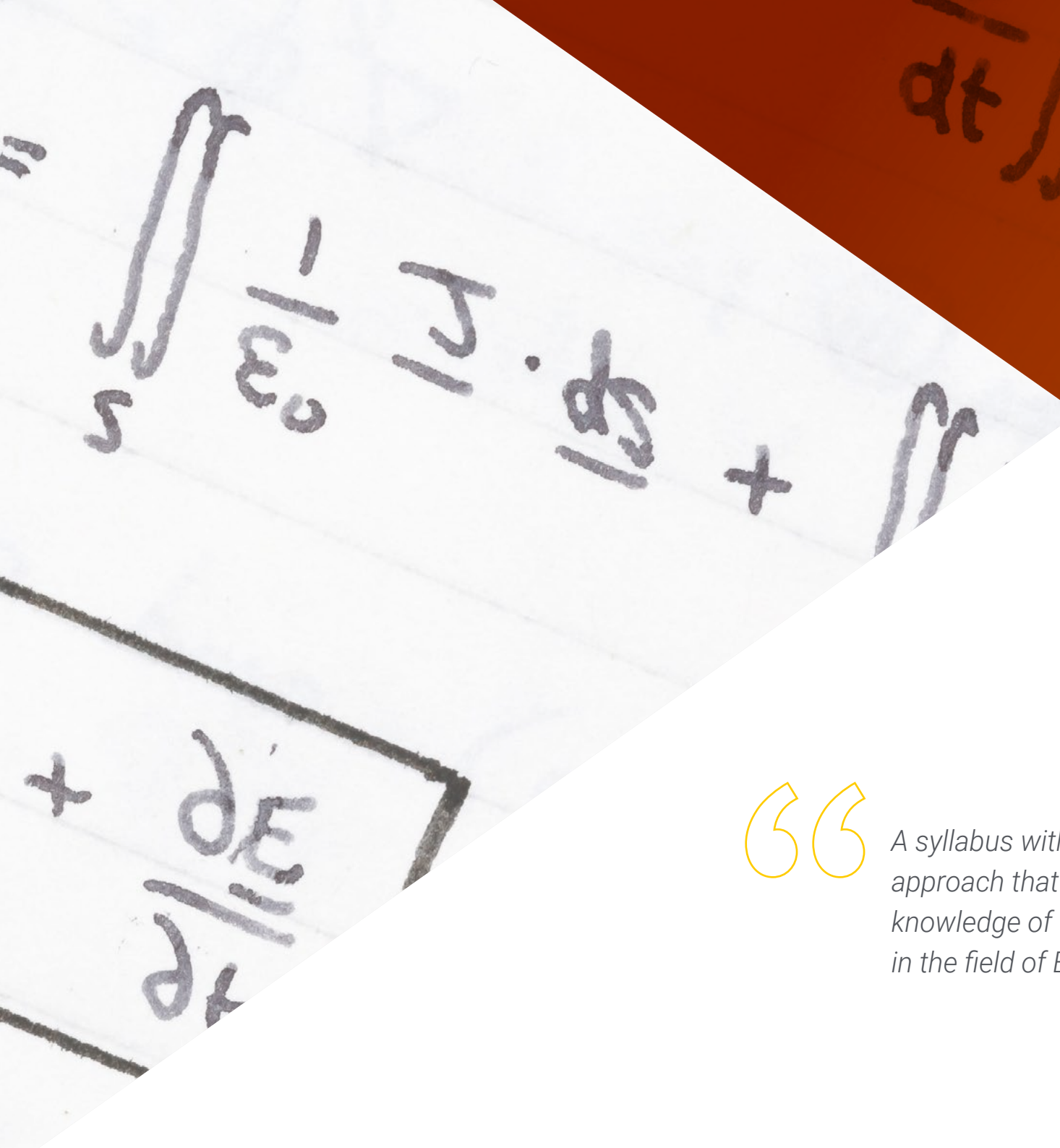
### Module 3. Fluid Mechanics

- Understand the general concepts of Fluid Physics and solve related problems
- Know the basic characteristics of fluids and their behaviors under various conditions
- Know the constitutive equations
- Acquire confidence in the handling of the Navier-Stokes equations

03

# Structure and Content

The effectiveness of the Relearning System, based on the reiteration of content, has led TECH to include it in all its programs This will allow students to progress in a much more natural way through the 3 modules that make up this degree. In addition, among the advantages of this method is the reduction of the long hours of study so frequent in other teaching methods. In this way, it will be much easier to acquire intensive learning about Climate Physics.



*A syllabus with a theoretical-practical approach that will allow you to update your knowledge of Geophysics and its application in the field of Engineering"*

## **Module 1.** Geophysics

1.1. Introduction
- 1.1.1. Physics of the Earth
- 1.1.2. Concept and Development of Geophysics
- 1.1.3. Characteristics of Geophysics
- 1.1.4. Disciplines and Fields of Study
- 1.1.5. Coordinate Systems

1.2. Gravity and Shape of the Earth
- 1.2.1. Size and Shape of the Earth
- 1.2.2. Earth's Rotation
- 1.2.3. Laplace's Equation
- 1.2.4. Figure of the Earth
- 1.2.5. The Geoid and the Normal Gravity Ellipsoid

1.3. Gravity Measurements and Anomalies
- 1.3.1. Air-Free Anomaly
- 1.3.2. Bouguer Anomaly
- 1.3.3. Isostasy
- 1.3.4. Interpretation of Local and Regional Anomalies

1.4. Geomagnetism
- 1.4.1. Sources of the Earth's Magnetic Field
- 1.4.2. Fields Produced by Dipoles
- 1.4.3. Components of the Terrestrial Magnetic Field
- 1.4.4. Harmonic Analysis: Separation of Fields of Internal and External Origin

1.5. Earth's Internal Magnetic Field
- 1.5.1. Dipole Field
- 1.5.2. Geomagnetic Poles and Geomagnetic Coordinates
- 1.5.3. Non-Dipole Field
- 1.5.4. International Reference Geomagnetic Field
- 1.5.5. Temporal Variation of the Internal Field
- 1.5.6. Origin of the Internal Field



1.6. Paleomagnetism
- 1.6.1. Magnetic Properties of Rocks
- 1.6.2. Remnant Magnetization
- 1.6.3. Geomagnetic Virtual Poles
- 1.6.4. Paleomagnetic Poles
- 1.6.5. Apparent Polar Drift Curves
- 1.6.6. Paleomagnetism and Continental Drift
- 1.6.7. Geomagnetic Field Inversions
- 1.6.8. Marine Magnetic Anomalies

1.7. External Magnetic Field
- 1.7.1. Origin of the External Magnetic Field
- 1.7.2. Structure of the Magnetosphere
- 1.7.3. Ionosphere
- 1.7.4. Variations of the External Field: Diurnal Variation, Magnetic Storms
- 1.7.5. Polar Auroras

1.8. Seismic Wave Generation and Propagation
- 1.8.1. Mechanics of an Elastic Medium: Elastic Parameters of the Earth
- 1.8.2. Seismic Waves: Internal and Surface Waves
- 1.8.3. Reflection and Refraction of Internal Waves
- 1.8.4. Trajectories and Travel Times: Dromochrons

1.9. Internal Structure of Earth
- 1.9.1. Radial Variation of the Seismic Wave Velocity
- 1.9.2. Reference Earth Models
- 1.9.3. Physical and Compositional Stratification of the Earth
- 1.9.4. Density, Gravity, and Pressure within the Earth
- 1.9.5. Seismic Tomography

1.10. Landslides
- 1.10.1. Location and Time of Origin
- 1.10.2. Global Seismicity in Relation to Plate Tectonics
- 1.10.3. Size of an Earthquake: Intensity, Magnitude, Energy
- 1.10.4. Gutenberg-Richter Law

## **Module 2.** Physics of Materials

2.1. Materials Science and Solid State
- 2.1.1. Field of Study of Materials Science
- 2.1.2. Classification of Materials According to the Type of Bonding
- 2.1.3. Classification of Materials According to Their Technological Applications
- 2.1.4. Relationship between Structure, Properties and Processing

2.2. Crystalline Structures
- 2.2.1. Order and Disorder: Basic Concepts
- 2.2.2. Crystallography: Fundamental Concepts
- 2.2.3. Review of Basic Crystal Structures: Simple Metallic and Ionic Structures
- 2.2.4. More Complex Crystal Structures (Ionic and Covalent)
- 2.2.5. Structure of Polymers

2.3. Defects in Crystalline Structures
- 2.3.1. Classification of Imperfections
- 2.3.2. Structural Defects
- 2.3.3. Punctual Defects
- 2.3.4. Other Imperfections
- 2.3.5. Dislocations
- 2.3.6. Interfacial Defects
- 2.3.7. Extended Defects
- 2.3.8. Chemical Imperfections
- 2.3.9. Substitutional Solid Solutions
- 2.3.10. Interstitial Solid Solutions

2.4. Phase Diagrams
- 2.4.1 Fundamental Concepts
  - 2.4.1.1. Solubility Limit and Phase Equilibrium
  - 2.4.1.2. Interpretation and Use of Phase Diagrams: Gibbs Phase Rule
- 2.4.2. 1 Component Phase Diagram
- 2.4.3. 2 Component Phase Diagram
  - 2.4.3.1. Total Solubility in the Solid State
  - 2.4.3.2. Total Insolubility in the Solid State
  - 2.4.3.3. Partial Solubility in Solid State
- 2.4.4. 3 Component Phase Diagram

2.5. Mechanical Properties
- 2.5.1. Elastic Deformation
- 2.5.2. Plastic Deformation
- 2.5.3. Mechanical Testing
- 2.5.4. Fracture
- 2.5.5. Fatigue
- 2.5.6. Fluence

2.6. Electrical Properties
- 2.6.1. Introduction
- 2.6.2. Conductivity. Conductors
- 2.6.3. Semiconductors
- 2.6.4. Polymers
- 2.6.5. Electrical Characterization
- 2.6.6. Insulators
- 2.6.7. Conductor-Insulator Transition
- 2.6.8. Dielectrics
- 2.6.9. Dielectric Phenomena
- 2.6.10. Dielectric Characterization
- 2.6.11. Materials of Technological Interest

2.7. Magnetic Properties
- 2.7.1. Origin of Magnetism
- 2.7.2. Materials with Magnetic Dipole Moment
- 2.7.3. Types of Magnetism
- 2.7.4. Local Field
- 2.7.5. Diamagnetism
- 2.7.6. Paramagnetism
- 2.7.7. Ferromagnetism
- 2.7.8. Antiferromagnetism
- 2.7.9. Ferrimagnetism

2.8. Magnetic Properties II
- 2.8.1. Domains
- 2.8.2. Hysteresis
- 2.8.3. Magnetostriction
- 2.8.4. Materials of Technological Interest: Magnetically Soft and Hard
- 2.8.5. Characterization of Magnetic Materials



2.9. Thermal Properties
- 2.9.1. Introduction
- 2.9.2. Heat Capacity
- 2.9.3. Thermal Conduction
- 2.9.4. Expansion and Contraction
- 2.9.5. Thermoelectric Phenomena
- 2.9.6. Magnetocaloric Effect
- 2.9.7. Characterization of Thermal Properties

2.10. Optical Properties: Light and Matter
- 2.10.1. Absorption and Re-Emission
- 2.10.2. Light Sources
- 2.10.3. Energy Conversion
- 2.10.4. Optical Characterization
- 2.10.5. Microscopy Techniques
- 2.10.6. Nanostructures

## **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 Fluid Model
3.10.6. Advanced Constitutive Equations and Geometry

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

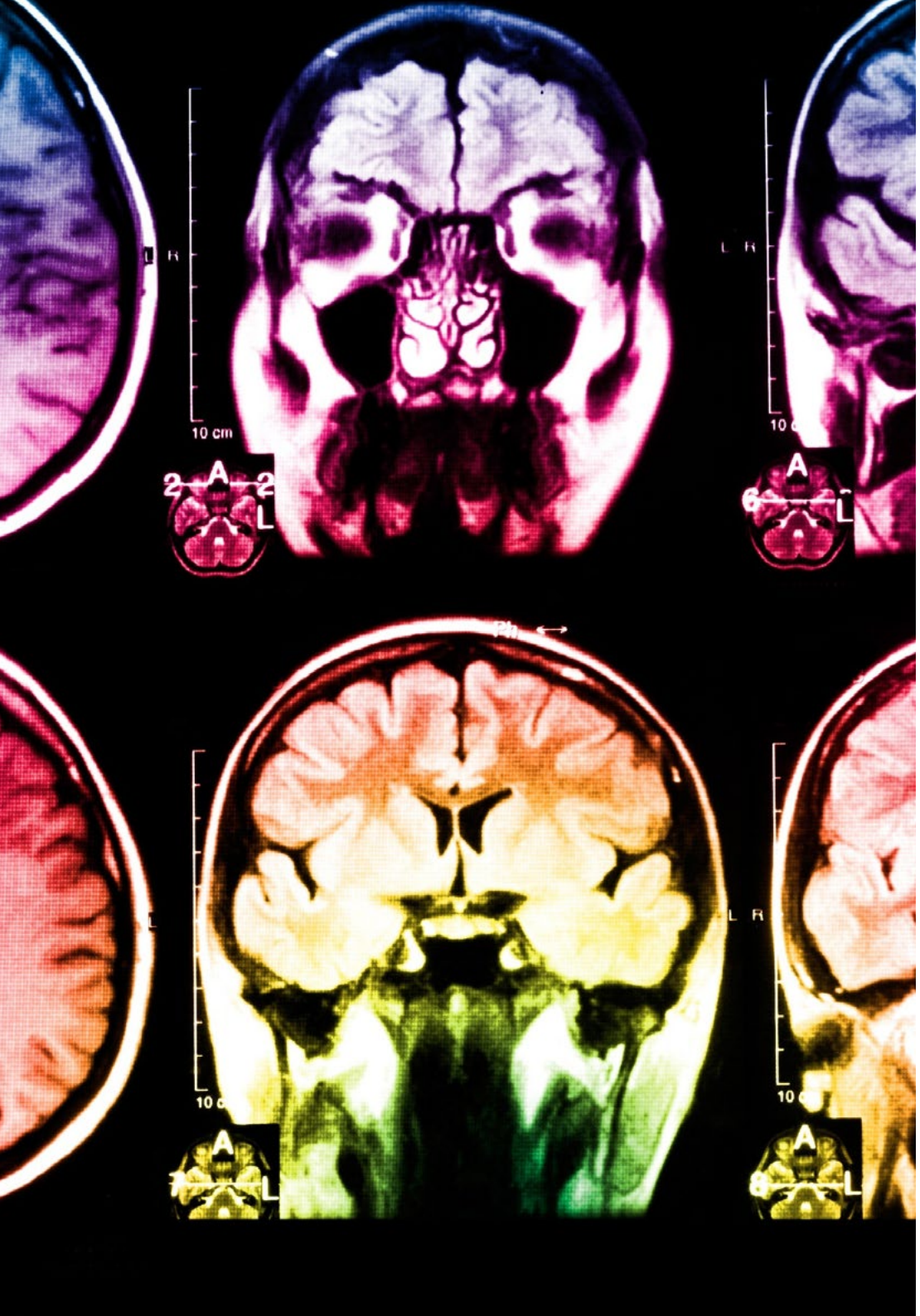
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines 8 different teaching elements in each lesson.

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.

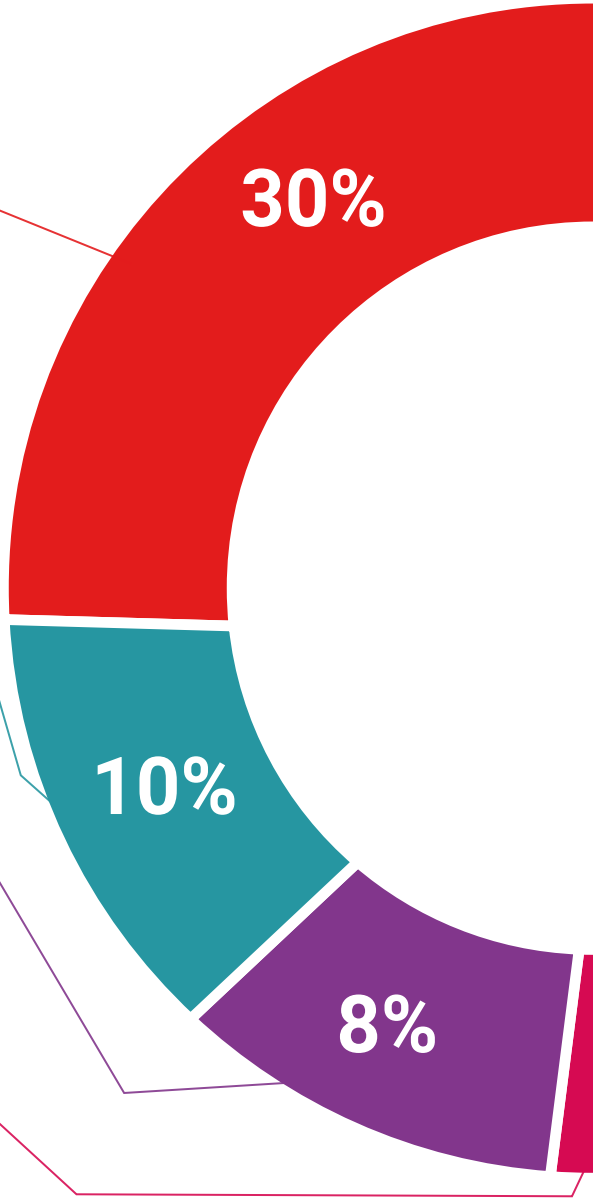
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

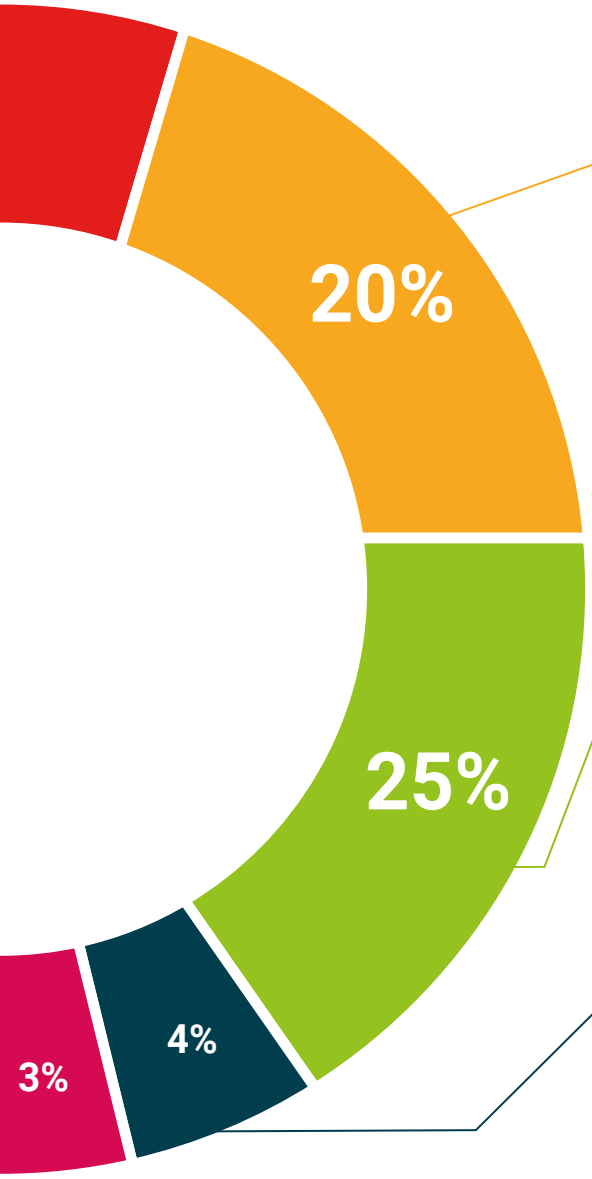
### Practising Skills and Abilities

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.

05

# Certificate

The Postgraduate Diploma in Geophysics guarantees 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 university qualification without having to travel or fill out laborious paperwork"*

This **Postgraduate Diploma in Geophysics** 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 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.

Title: **Postgraduate Diploma in Geophysics**

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 DIPLOMA

in

Geophysics

This is a qualification awarded by this University, equivalent to 450 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

This qualification must always be accompanied by the university degree issued by the competent authority to practice professionally in each country. 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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