Postgraduate Certificate
Applied Mathematics

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Postgraduate Certificate
Applied Mathematics

- Modality: **online**
- Duration: **12 weeks**
- Certificate: **TECH Technological University**
- Dedication: **16h/week**
- Schedule: **at your own pace**
- Exams: **online**

Website: **www.techtitute.com/pk/engineering/postgraduate-certificate/applied-mathematics**

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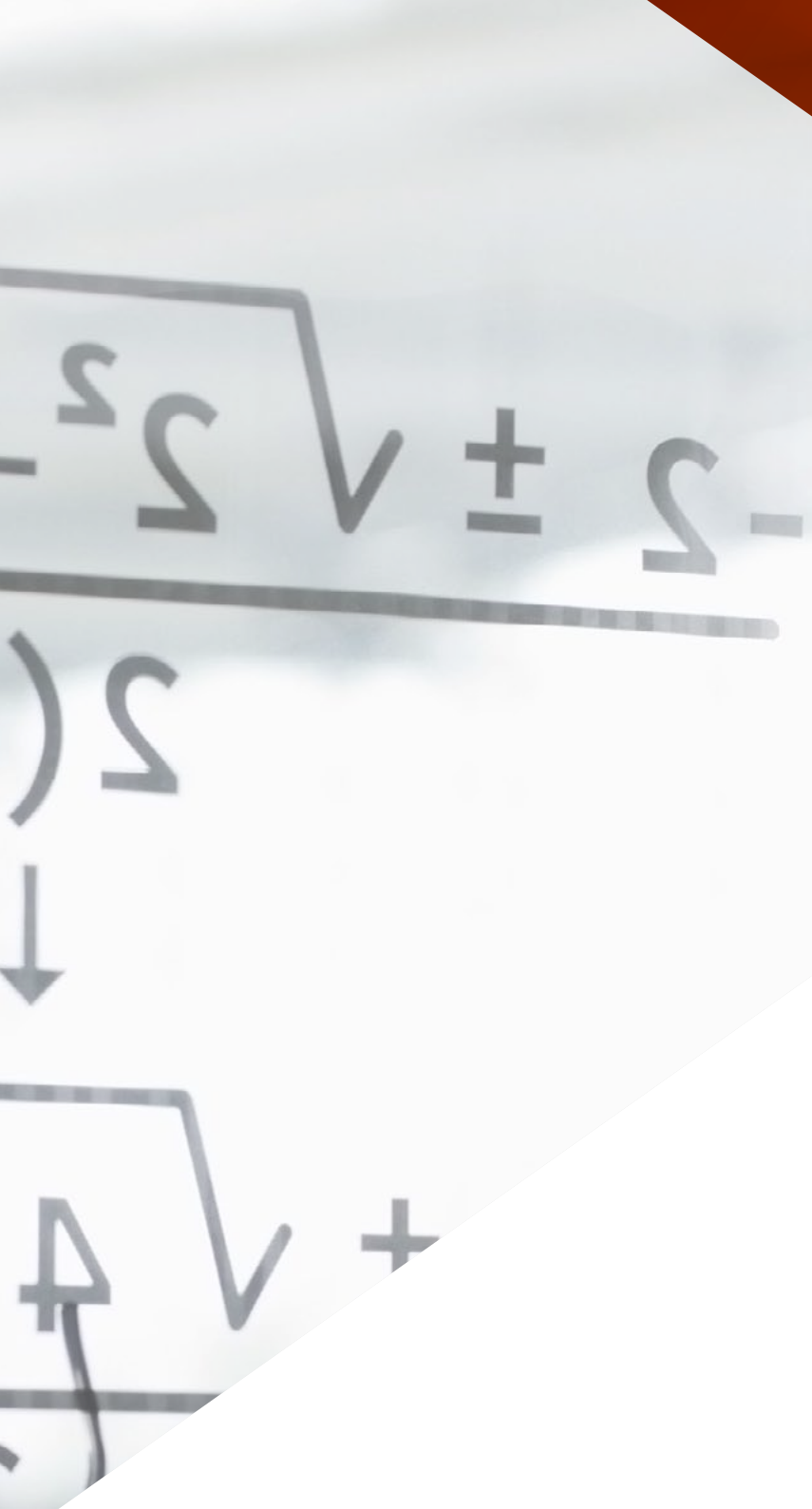
01

Introduction

Mathematics is transversally involved in the process of industrial technological evolution and all its development. Its use is necessary to establish calculations and advanced solutions in different cases, both in the technological industry and in the financial, architectural, analytical and research industries, among others. Despite its importance, few professionals become experts in this area. This is where a range of possibilities opens up for those who decide to focus on providing solutions within a thriving industrial sector, and for those who intend to meet these demands. This is how this program becomes the effective solution for those who wish to raise their level of knowledge in Applied Mathematics, through a completely online study program in a maximum of 12 weeks of duration based on the most innovative methodology of relearning.



Acquire updated knowledge of Applied Mathematics in 12 weeks and 100% online"

Applied Mathematics are part of the fundamental tools in the development of advanced solutions for production sectors, both for goods and services. They are the so-called invisible tools for the progress of processes and the application of cutting-edge techniques. Their objective is to promote more competitive innovation and high added value, and thus guarantee the future value of the company; all this through numbers.

The development of Industry 4.0 processes requires transformation and innovation, combining the use of algorithms to obtain data that provide the information the company needs to make solid decisions. It is there where digitalization and mathematics are unified in the same objective: To optimize processes, products, *stocks* and services, as well as to improve product quality, without losing sight of the commitment to cost reduction and sustainability.

It is then when mathematics professionals become essential in the company, and become one of the most demanded specialties in this 4th Industrial Revolution. For that reason, this program is focused on training in quantitative knowledge to make economic and management decisions in situations proposed within the company, using computer tools applied to the resolution of operational research problems.

This Postgraduate Certificate in Applied Mathematics, presents the content in 2 modules with a specialized syllabus rigorously selected so professionals gain a deep understanding of operational research, its phases and techniques, network optimization and application in project planning, and types of schedules. Furthermore, they will learn to adequately use the basic mathematical elements within the business organization and to effectively communicate the results in written and oral form.

Among other aspects that will be developed in depth, designed in a convenient online format, which allows professionals to take on the course load at their own pace and in complete freedom of how, where and when to train. From day one, all the content will be available in the virtual classroom, both for consultation and for downloading from any device with an internet connection, which greatly facilitates study time.

This **Postgraduate Certificate in Applied Mathematics** contains the most complete and up-to-date scientific program on the market. The most important features include:

- Practical case studies are presented by experts in Applied Mathematics
- The graphic, schematic, and eminently practical contents with which they are created, provide scientific and practical information on the disciplines that are essential for professional practice
- Practical exercises where the self-assessment process can be 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 assignments
- Access to content from any fixed or portable device with an Internet connection

Enhance your skills and update your knowledge regarding all the fundamentals of Applied Mathematics in industrial engineering"

The best content and the variety of practical cases based on real problems will equip you with the necessary knowledge to make your work more efficient"

Dare to take the leap toward this new way of studying and strive for success from the comfort of your favorite device.

This Postgraduate Certificate will enable you to apply the mathematical reasoning in industrial engineering to the company.

The program's teaching staff includes professionals from sector who contribute their work experience to this training program, as well as renowned specialists from leading societies and prestigious universities.

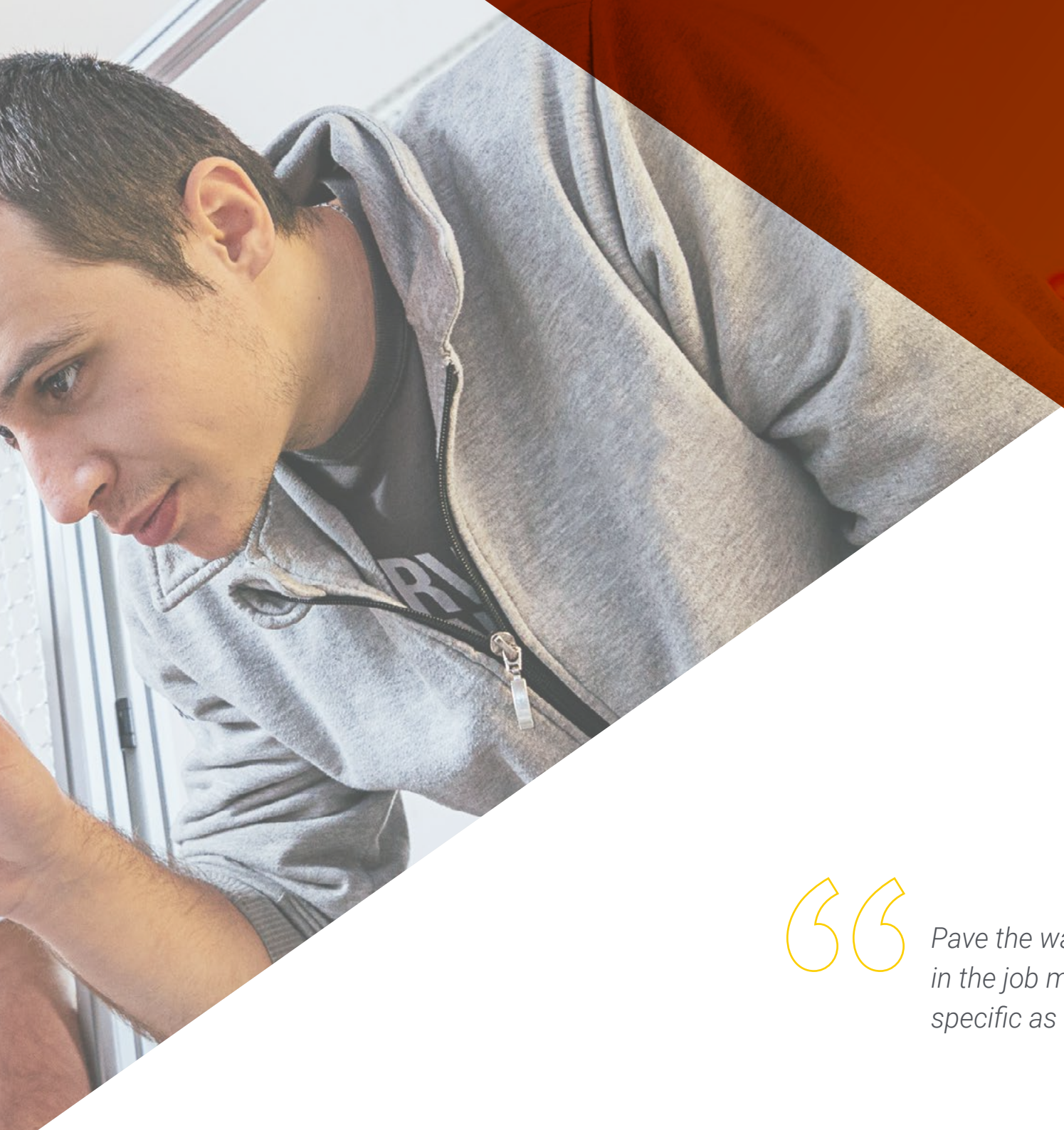
The multimedia content, developed with the latest educational technology, will provide the professional with situated and contextual learning, i.e., a simulated environment that will provide immersive training programmed to train in real situations.

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.

02

Objectives

This refresher program aims to provide professionals linked to industrial processes all the fundamental knowledge of Applied Mathematics in engineering, adapted to the demands of organizations today and in the future. For this purpose, TECH has selected the most updated content, combining theory with the practical knowledge necessary to assimilate all the information.

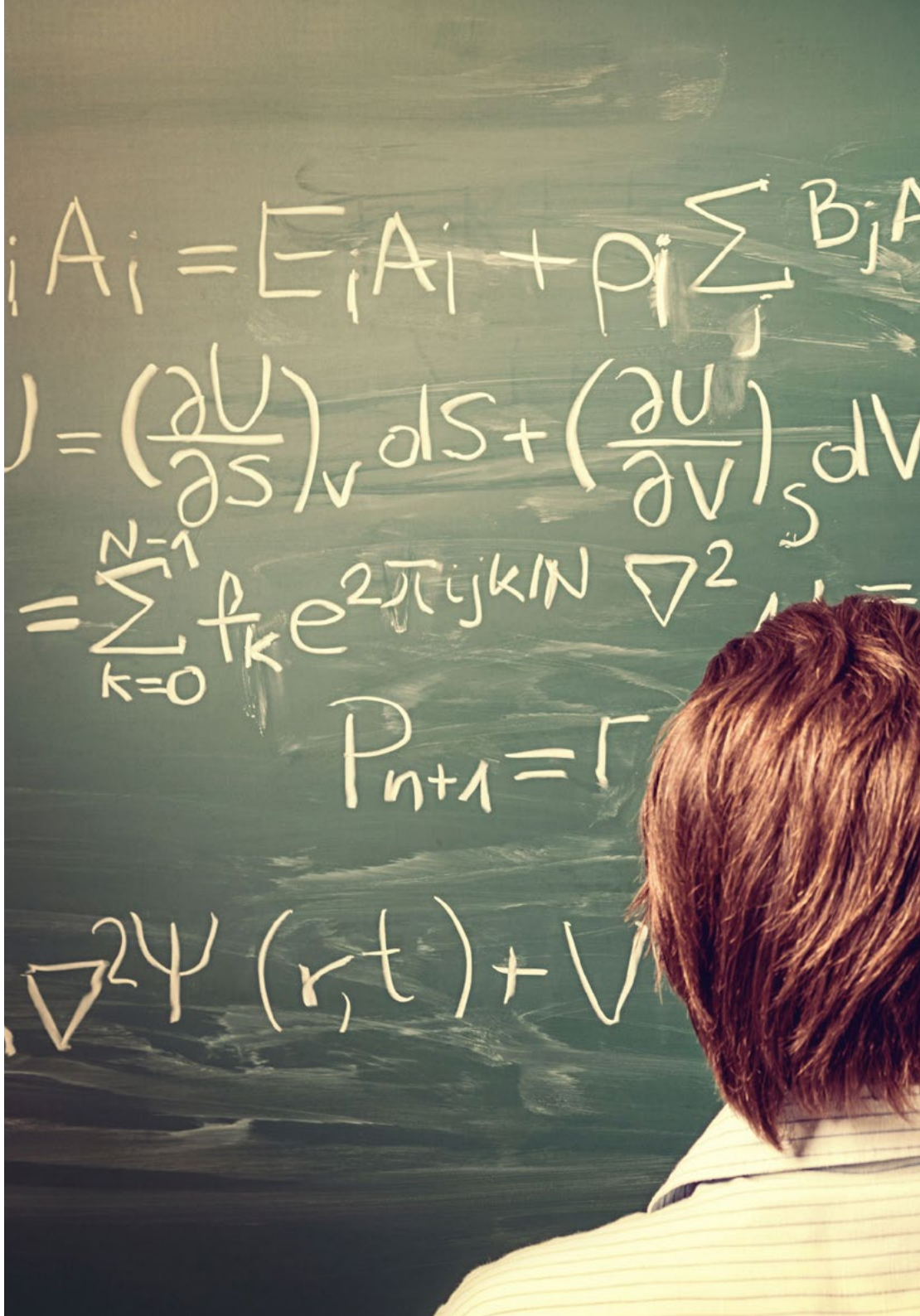


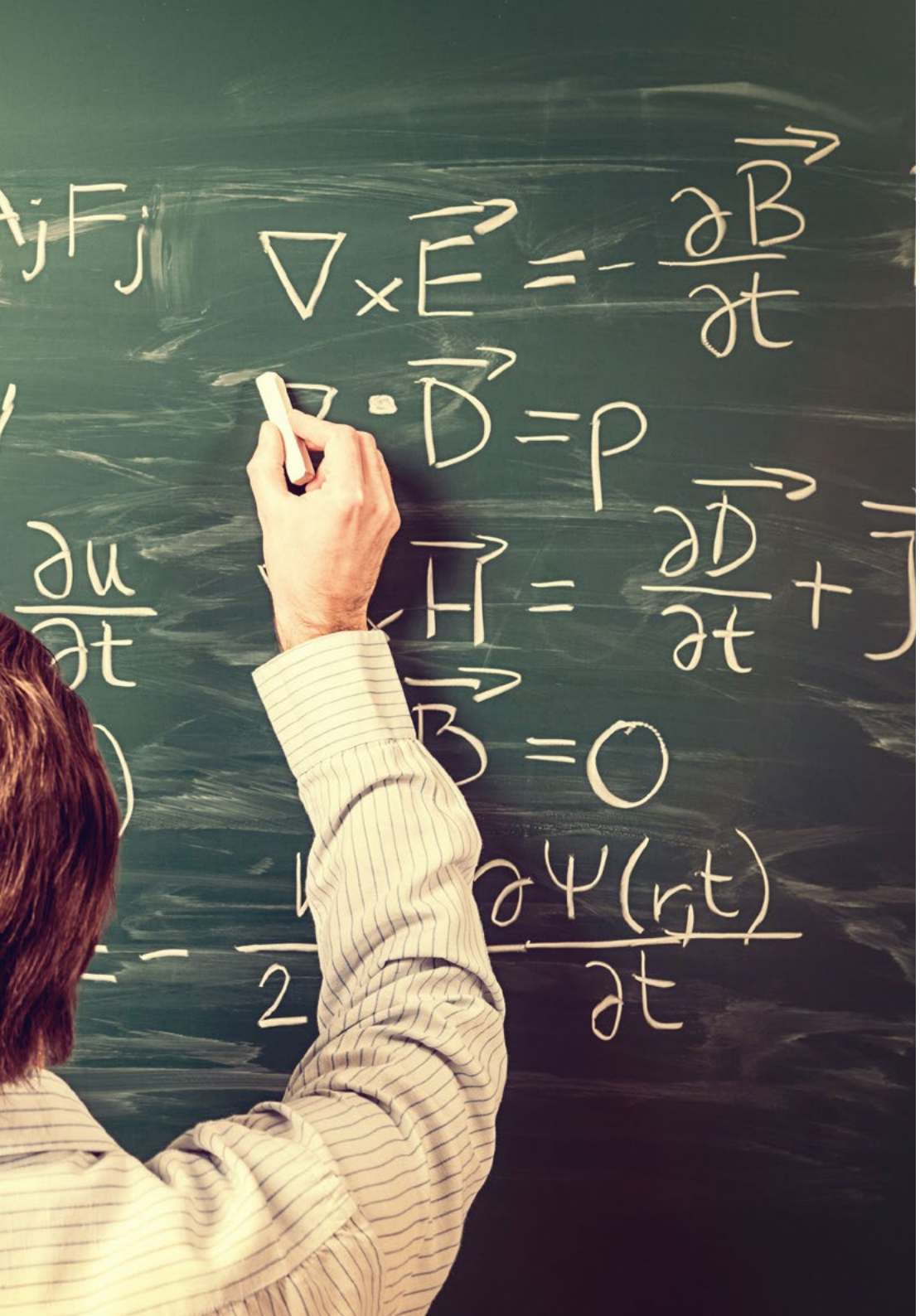
Pave the way to new possibilities in the job market with training as specific as this one"

General Objectives

- Understand the basic elements that make up business mathematics in order to offer advanced solutions
- Gain a deeper understanding of existing mathematical techniques and methods, as well as their use in problem solving
- Understand the economic applications of finite difference equations
- Understand the business implications of mathematical reasoning in proposed situations
- Study the economic interpretation of duality
- Contemplate the various types of problems encountered in operations research
- Acquire the most up-to-date knowledge of mathematical methods and operations research

With this Postgraduate Certificate you will become familiar with the basic elements that make up business mathematics"





Specific Objectives

- Know the basic elements that make up business mathematics: linear and matrix algebra, matrices, matrix transposition, calculus, matrix inversion or systems of equations
- Proper use of the basic elements within business organization
- Know the different existing mathematical techniques and methods
- Apply mathematical techniques and methods within the financial framework of the company
- Effectively communicate in written and oral form with clarity and rigor
- Identify the applications of mathematical reasoning in industrial engineering
- Apply the mathematical reasoning in industrial engineering to the company in proposed situations
- Identify phases and techniques in operations research and their application
- Apply mathematical functions in decision making to optimize resources in specific cases
- Interpret quantitative results for economic and managerial decision making in proposed situations
- Use mathematical calculation software for decision making in proposed cases
- Use computer tools applied to the resolution of operational research problems

03

Structure and Content

A program dedicated to today's professionals who wish to advance their career while balancing it with their current busy schedule. The deliberate distribution of the contents throughout two modules will allow students to easily grasp the concepts thanks to the *relearning* study methodology of which TECH is a pioneer. This, together with the variety of multimedia resources available, the guidance of renowned experts, the most secure and cutting-edge platforms, serves as the seal of quality for the training.

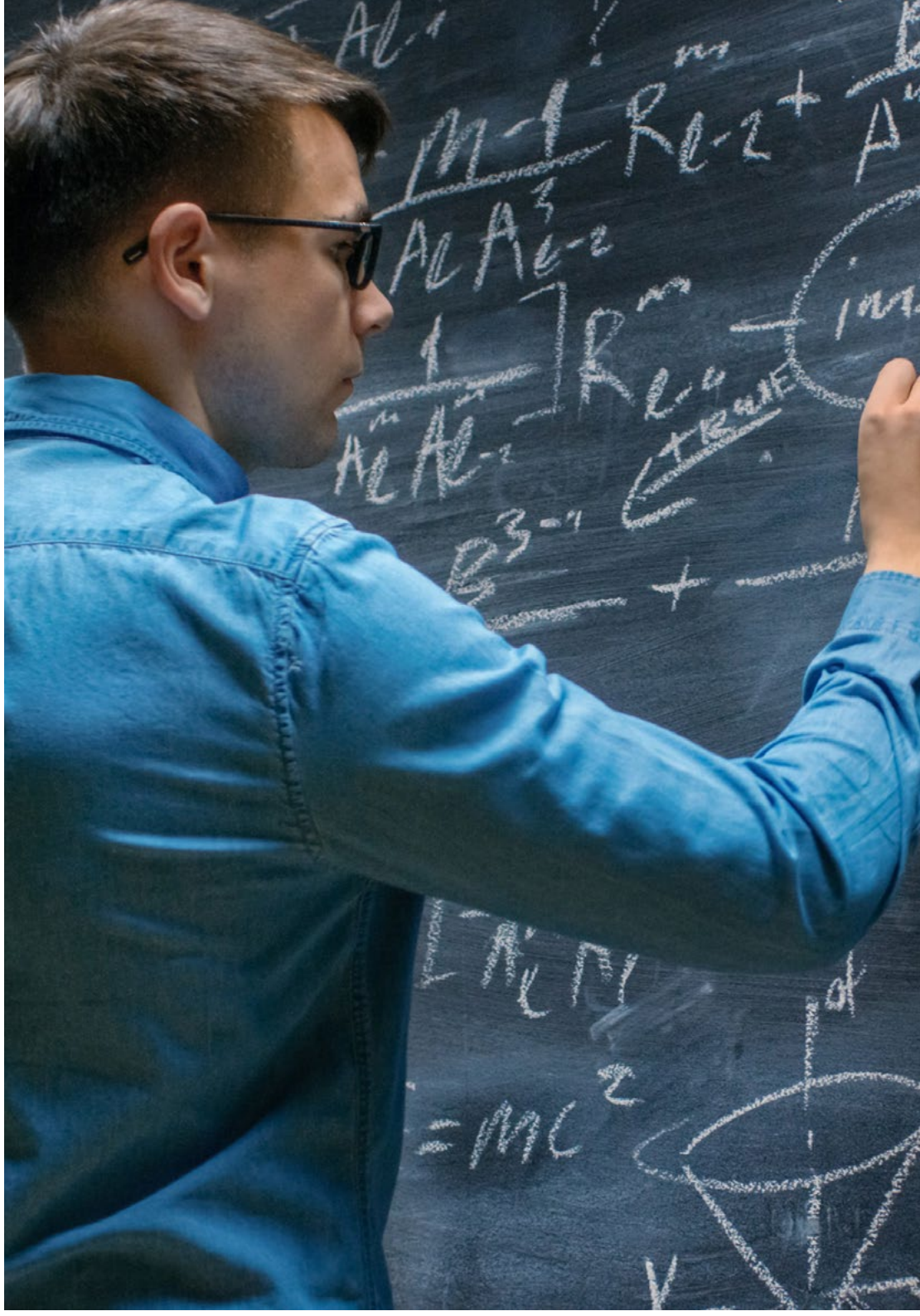
Examples and practical exercises will be made available to you in a variety of multimedia resources for your efficient progress in the program"

Module 1. Mathematics III

1.1. Multi-variable Functions
- 1.1.1. Terminology and Basic Mathematical Concepts
- 1.1.2. Definition of IRn Functions in IRm
- 1.1.3. Graphic Representation
- 1.1.4. Types of Functions
  - 1.1.4.1. Scaled Functions
    - 1.1.4.1.1. Concave Function and Its Application to Economic Research
    - 1.1.4.1.2. Convex Function and Its Application to Economic Research
    - 1.1.4.1.3. Level Curves
  - 1.1.4.2. Vectorial Functions
  - 1.1.4.3. Operations with Functions

1.2. Multi-variable Real Functions
- 1.2.1. Function Limits
  - 1.2.1.1. Point Limit of an IRn Function in IRm
  - 1.2.1.2. Directional Limits
  - 1.2.1.3. Double Limits and Their Properties
  - 1.2.1.4. Limit of an IRn Function in IRm
- 1.2.2. Continuity Study of Multi-variable Functions
- 1.2.3. Function Derivatives: Successive and Partial Derivatives Concept of Differential of a Function
- 1.2.4. Differentiation of Compound Functions: Chain Rule
- 1.2.5. Homogenous Functions
  - 1.2.5.1. Properties
  - 1.2.5.2. Euler's Theorem and Its Economic Interpretation

1.3. Optimization
- 1.3.1. Definition
- 1.3.2. Searching and Interpreting Optimum
- 1.3.3. Weierstrass' Theorem
- 1.3.4. Local-Global Theorem



1.4. Unconstrained and Constrained Equality Optimization
- 1.4.1. Taylor's Theorem Applied to Multi-variable Functions
- 1.4.2. Unconstrained Optimization
- 1.4.3. Constrained Optimization
  - 1.4.3.1. Direct Method
  - 1.4.3.2. Interpreting Lagrange Multipliers
    - 1.4.3.2.1. Hessian Matrix

1.5. Optimization with Inequality Constraints
- 1.5.1. Introduction
- 1.5.2. Necessary First-order Conditions for the Existence of Local Optima: Kuhn-Tucker's Theorem and Its Economic Interpretation
- 1.5.3. Globality Theorem: Convex Programming

1.6. Lineal Programming
- 1.6.1. Introduction
- 1.6.2. Properties
- 1.6.3. Graphic Resolution
- 1.6.4. Applying Kuhn-Tucker Conditions
- 1.6.5. Simplex Method
- 1.6.6. Economic Applications

1.7. Integral Calculus: Riemann's Integral
- 1.7.1. Definition and Application in Economics
- 1.7.2. Properties
- 1.7.3. Integrability Conditions
- 1.7.4. Relation between Integrals and Derivatives
- 1.7.5. Integration by Parts
- 1.7.6. Change of Variables Integration Method

1.8. Applications of Rienmann's Integral in Business and Economics
- 1.8.1. Distribution Function
- 1.8.2. Present Value of a Cash Flow
- 1.8.3. Mean Value of a Function in an Enclosure
- 1.8.4. Pierre-Simon Laplace and His Contribution

1.9. Ordinary Differential Equations
- 1.9.1. Introduction
- 1.9.2. Definition
- 1.9.3. Classification
- 1.9.4. First-Order Differential Equations
  - 1.9.4.1. Resolution
  - 1.9.4.2. Bernoulli's Differential Equations
- 1.9.5. Exact Differential Equations
  - 1.9.5.1. Resolution
- 1.9.6. Greater Than One Ordinary Differential Equations (with Constant Coefficients)

1.10. Finite Difference Equations
- 1.10.1. Introduction
- 1.10.2. Discrete Variable Functions or Discrete Functions
- 1.10.3. First-order Linear Finite Difference Equations with Constant Coefficients
- 1.10.4. Order n Linear Finite Difference Equations with Constant Coefficients
- 1.10.5. Economic Applications

Module 2. Mathematical Methods and Operations Research

2.1. Introduction to Operations Research
- 2.1.1. History of Operations Research
- 2.1.2. Applications
- 2.1.3. Operations Research Stages
- 2.1.4. Operations Research Techniques
- 2.1.5. Implementation

2.2. Lineal Programming: Formulating Problems
- 2.2.1. Linear Programming Modeling
- 2.2.2. Graphic Method
- 2.2.3. Approaching Lineal Programming Problems
- 2.2.4. Applications and Examples

2.3. Simplex Method
- 2.3.1. Set and Convex Functions
- 2.3.2. Resolution Algorithms
- 2.3.3. Simplex Method Algebra: Algorithm Calculus
- 2.3.4. Post-Optimum Analysis
- 2.3.5. Revised Simplex Method

2.4. Duality Theory
- 2.4.1. Introduction to Duality
- 2.4.2. Duality Theory
- 2.4.3. Economic Interpretation of Duality
- 2.4.4. Dual Simplex Algorithm

2.5. Post-Optimization
- 2.5.1. Need for Post-optimal Analysis
- 2.5.2. Sensitivity Analysis
- 2.5.3. Parametric Analysis
- 2.5.4. Linear Programming Model Solutions Using Spreadsheets

2.6. Transport Problems
- 2.6.1. Introduction
- 2.6.2. Transport Simplex Method
- 2.6.3. Dummy Destination and Origin
- 2.6.4. Degenerate Solutions
- 2.6.5. Impossible Transports: M Method

2.7. Allocation Problems
- 2.7.1. Introduction
- 2.7.2. Hungarian Algorithm
- 2.7.3. Dummy Resources
- 2.7.4. Dummy Tasks for Resources Unable to Perform a Certain Task

2.8. Network Optimization: Project Planning Application
- 2.8.1. Types of Network Optimization Models
- 2.8.2. Monte Carlo Method
- 2.8.3. Planning and Programming Projects
- 2.8.4. Defining and Sequencing Activities
- 2.8.5. Critical Path Method (CPM) with Cost/Time Trade-offs
- 2.8.6. ROY Method

2.9. Dynamic Programming
- 2.9.1. Dynamic Programming Problem Features
- 2.9.2. Dynamic Programming Prototype
- 2.9.3. Deterministic Dynamic Programming

2.10. Integer Programming and Nonlinear Programming
- 2.10.1. Integer Programming Applications
- 2.10.2. Integer Programming Prototype
- 2.10.3. Non-Lineal Programming
- 2.10.4. Non-Lineal Programming Applications
- 2.10.5. Graphic Solutions for Non-Lineal Programming Problems

Enroll now and graduate in 12 weeks with the most innovative study methodology in today's online university environment"

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"

At TECH we use the Case Method

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

At TECH, you will experience a way of learning that is shaking the foundations of traditional universities around the world"

We are the first online university to combine Harvard Business School case studies with a 100% online learning system based on repetition.

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

A learning method that is different and innovative

This intensive Engineering program at TECH Technological University prepares you to face all the challenges in this field, both nationally and internationally. We are committed to promoting your personal and professional growth, the best way to strive for success, that is why at TECH Technological University you will use Harvard *case studies*, with which we have a strategic agreement that allows us, to offer you material from the best university in the world.

> *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 by 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

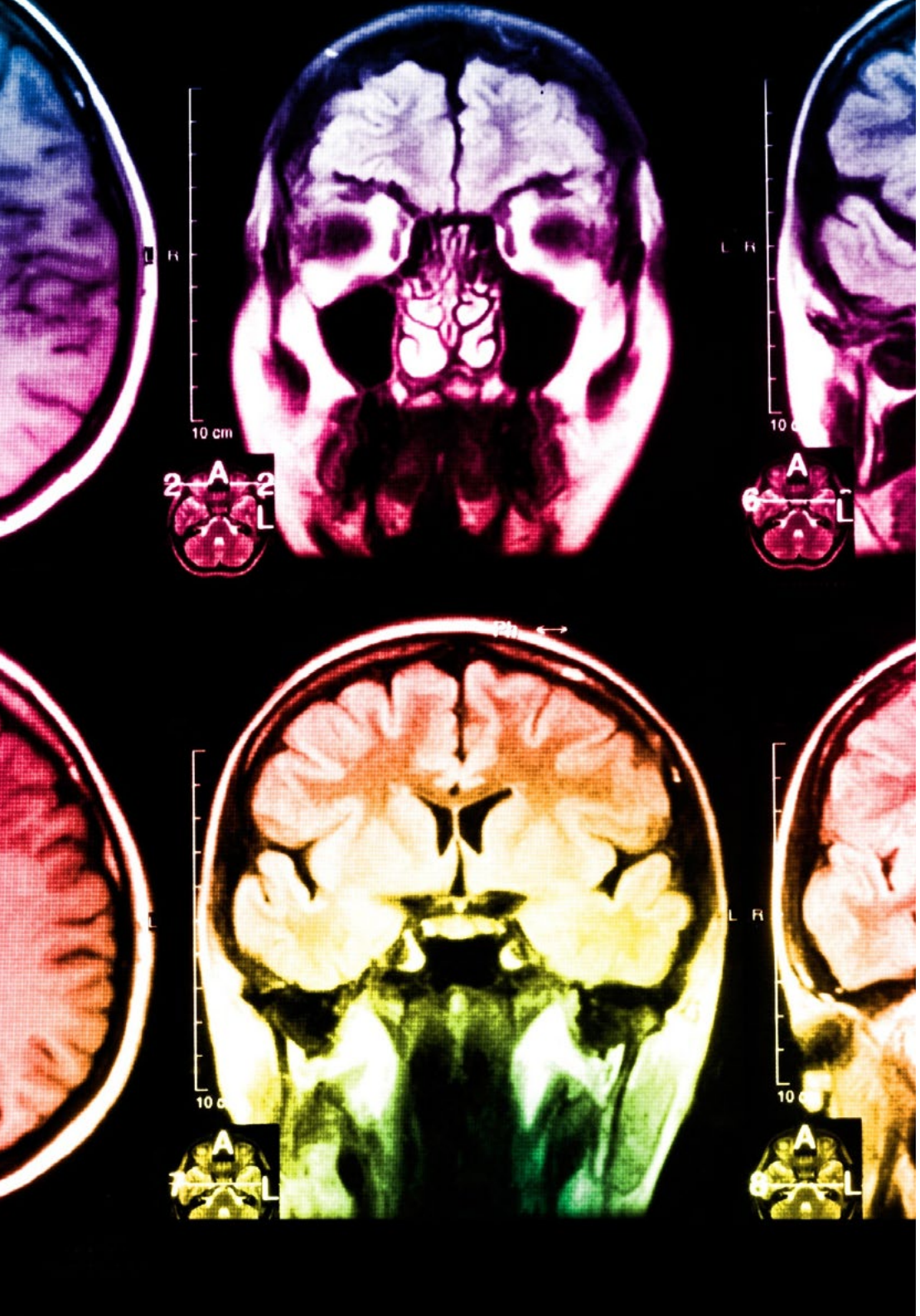
TECH is the first university in the world to combine Harvard University *case studies*with a 100% online learning system based on repetition, which combines 8 different didactic elements in each lesson.

We enhance Harvard *case studies* 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 university 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

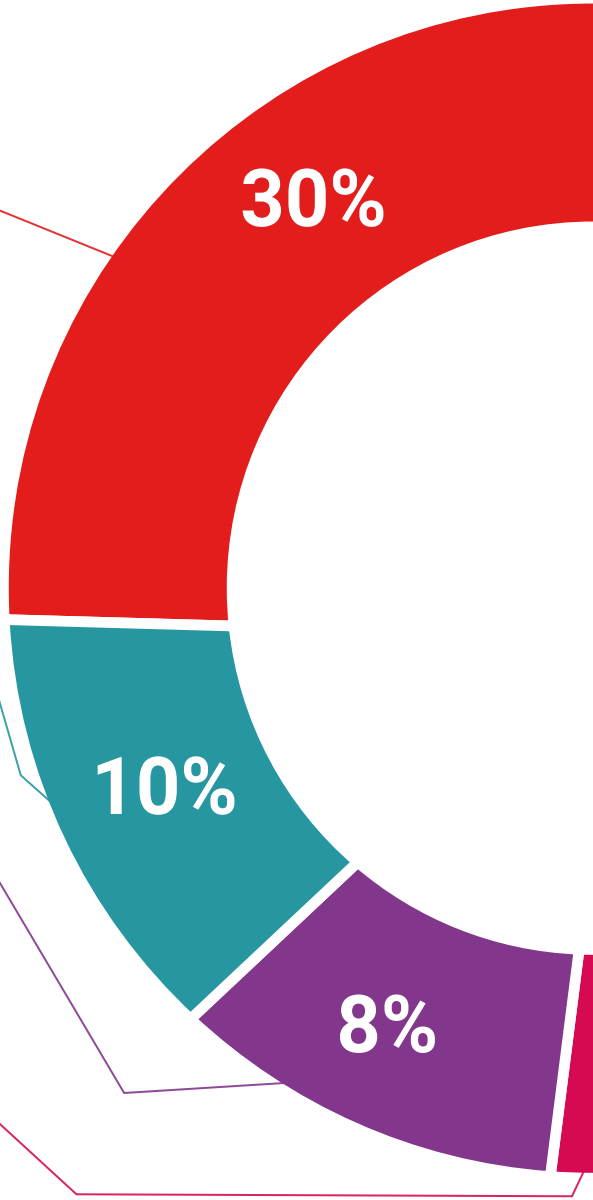
There is scientific evidence suggesting that observing third-party experts can be useful. Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

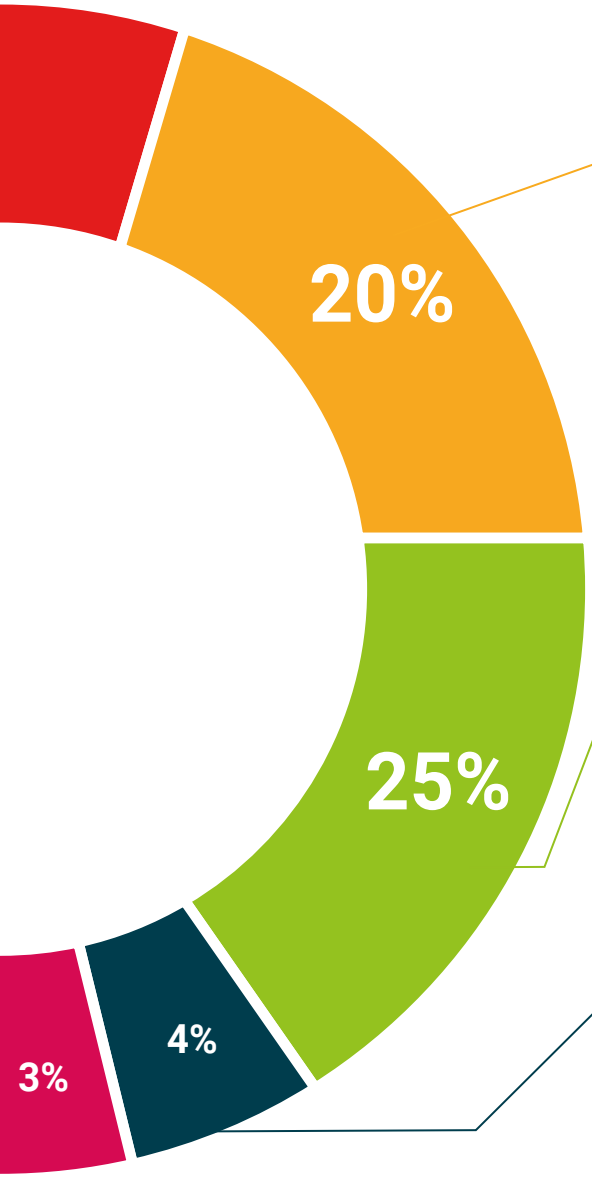
Practising Skills and Abilities

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

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

They will complete a selection of the best case studies in the field used at Harvard. Cases that are presented, analyzed, and supervised by the best senior management 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 multimedia content presentation training Exclusive system 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 your goals.

05

Certificate

The Postgraduate Certificate in Applied Mathematics guarantees, in addition to the most rigorous and up-to-date training, access to a qualification issued by TECH Technological University.

Successfully complete this training program and receive your university certificate without travel or laborious paperwork"

This **Postgraduate Certificate in Applied Mathematics** 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 it meets the requirements commonly demanded by labor exchanges, competitive examinations, and professional career evaluation committees.

Title: **Postgraduate Certificate in Applied Mathematics**

Official Number of Hours: **300 h.**


tech technological university

Awards the following

CERTIFICATE

to

Mr./Ms. _____, with identification number _____.

For having passed and accredited the following program

POSTGRADUATE CERTIFICATE

in

Applied Mathematics

This is a qualification awarded by this University, equivalent to 300 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 certificate issued with an apostille, TECH EDUCATION will make the necessary arrangements to obtain it, at an additional cost.

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