# Postgraduate Diploma

## Parallel and Distributing Computing

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# Postgraduate Diploma

## Parallel and Distributed Computing

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

Website: www.techtitute.com/us/information-technology/postgraduate-diploma/postgraduate-diploma-parallel-distributed-computing

# Index

01

# Introduction

Parallel and Distributed Computing is undoubtedly the future of advanced computing. The continuing evolution of multi-core processors, the release of increasingly powerful *smartphones*, and the implementation of more efficient connection networks such as 5G are opening up an impressive range of possibilities. For this reason, it is crucial for computer scientists to possess comprehensive knowledge of Parallel and Distributed Computing, including its potential applications in fields such as climate analysis, power grids, and *big data frameworks*. This program is, therefore, an ideal option for achieving a distinctive professional boost guaranteed by the quality of its advanced knowledge.

*Stay updated on the latest advancements in Parallel and Distributed Computing, encompassing both theoretical and practical aspects, including parallel decomposition"*

The cloud has significantly expanded the possibilities in the realm of computing, particularly in the context of Parallel Computing. It has substantially decreased the cost of required services while simultaneously augmenting the available capacity. The combination of these factors, along with the emergence of new programming tools, has made Parallel and Distributed Computing accessible to ambitious computer scientists.

Whether the objective is to tackle projects of varying sizes or engage in computational research, this Postgraduate Diploma presents the most vital knowledge about Parallel and Distributed Computing in a convenient and accessible format, essential for every computer scientist.

All of this is delivered in a 100% online format, eliminating the need for face-to-face classes and fixed schedules. The entire program is available for students to download and they will be the ones to decide when to take on the full course load. The virtual classroom is accessible 24 hours a day, offering unparalleled flexibility for students to balance this Postgraduate Diploma with their other professional or personal responsibilities.

This **Postgraduate Diploma in Parallel and Distributed Computing** 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 Parallel and Distributed Computing
- 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 self-assessment can be used to improve learning
- Its special emphasis on innovative methodologies
- Theoretical lessons, questions for experts and individual reflection work
- Content that is accessible from any fixed or portable device with an Internet connection

*Redirect your career towards advanced programming or even computational academic research environments by enrolling in this program"*

*You will delve into various forms of application of Parallel and Distributed Computing, including blockchain, databases, and distributed systems in the field of medicine"*

*Indeed, this program will provide the necessary quality boost to your CV, enabling your career to reach new heights.*

*You will have access to a comprehensive library of diverse multimedia resources, including videos created by the instructors.*

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

The multimedia content, developed using the latest educational technology, enables professionals to learn in a contextual and situated learning environment. This simulated environment provides immersive education, specifically designed to prepare individuals for real-life situations.

The program is designed with a focus on Problem-Based Learning, where professionals are required to solve various professional practice situations that are presented to them throughout the academic year. To facilitate this process, the students will receive assistance through an innovative interactive video system developed by renowned and experienced experts in the field.

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# Objectives

TECH's program in Parallel and Distributed Computing aims to equip computer scientists with both fundamental and cutting-edge knowledge in the field. Through its unique emphasis on contemporary computational theory and the latest industry developments, this Postgraduate Diploma will empower students to advance into positions of greater responsibility within the IT sector.

*Your professional goals and TECH's are aligned, so you will find the greatest support throughout the entire program"*

## General Objectives

- Analyze the difference between the Parallel and Distributed Computing components
- Measure and compare its development to analyze the performance of the different components
- In-depth analysis of cross-platform parallel computing to use task-level parallelism between different hardware accelerators
- Analyze in detail current software and architectures
- Develop in-depth the most relevant aspects of Parallel and Distributed Computing
- Specialize the students in the use of Parallel and Distributed Computing and its application in different industry sectors

*TECH's advanced teaching methodology ensures that you can integrate the knowledge you acquire into your daily practice even before completing the degree"*

## Specific Objectives

### Module 1. Parallel Decomposition in Parallel and Distributed Computing

- Analyze the importance of Parallel Decomposition of Processes in Computational Problem Solving
- Examine different examples to demonstrate the application and use of computation and its Parallel Decomposition
- Expose procedures and tools that allow the execution of parallel processes, seeking to obtain the best possible performance
- Develop specialized knowledge to identify parallel process decomposition scenarios and choose and apply the appropriate tool

### Module 2. Parallel Computing applied to *cloud* environments

- Developing the Cloud Computing Paradigm
- Identify the different approaches based on the degree of Automation and Service
- Analyze the main pieces of a cloud architecture
- Establishing the differences with an *On-Premise* Architecture
- Analyze the different Cloud Deployment options: *Multi-Cloud*, *Hybrid Cloud*
- Deepen the benefits inherent to Cloud Computing
- Develop the Cloud Computing economic principles: The transition from CAPEX to OPEX
- Evaluate the commercial offers from different suppliers
- Evaluate the capabilities of Supercomputing in the Cloud
- Examine Security in Cloud Computing

### Module 3. Parallel and Distributed Computing Applications

- Demonstrate the significant contributions of parallel and distributed computing applications to our environment
- Determine the reference architectures in the market
- Evaluate the benefits of the study cases
- Introduce successful solutions to the market
- Demonstrate why it is important to evaluate the climate change
- Determine the current importance of GPUs
- Present the impact of this technology on power grids
- Explore distributed engines to serve our customers
- Learn about the benefits of distributed engines to bring advantages to our companies
- Present examples of In-Memory Databases and their importance

03

# Course Management

This program has been carefully developed by a teaching team specifically selected by TECH. Their extensive knowledge of Parallel and Distributed Computing, along with their experience in leading important international projects, guarantees the quality of all the content. The students can be confident that they will have access to innovative theoretical and practical materials that are accurate and tailored to the latest advancements in Parallel and Distributed Computing.

*Through TECH's advanced virtual classroom, you will have the opportunity to create your own networking network and establish connections with accomplished IT professionals"*

## Management

### D. Olalla Bonal, Martín

- Senior Blockchain Practice Manager at EY
- Blockchain Client Technical Specialist for IBM
- Director of Architecture for Blocknitive
- Non-Relational Distributed Databases Team Coordinator for wedoIT (IBM Subsidiary)
- Infrastructure Architect at Bankia
- Head of Layout Department at T-Systems
- Department Coordinator for Bing Data Spain S.L

## Professors

### D. Gómez Gómez, Borja

- Business Development Manager for Cloud Innovation at Oracle
- Head of Blockchain and Pre-Sales Architecture Solutions at Digital Paradigm
- Senior IT Architect and Consultant at Atmira
- SOA Architect and TCP SI Consultant
- Analyst and Consultant at Everis
- Licensed in Computer Engineering from the Complutense University of Madrid
- Master's Degree in Science Computer Engineering at the Complutense University of Madrid

**Dr. Almendras Aruzamen, Luis Fernando**

- Data and Business Intelligence Engineer. Solutio Group, Madrid
- Data Engineer at Indizen
- Data and *business intelligence* engineer in Technology and People
- Database, *big data* and *business intelligence* support engineer at Equinix
- Data Engineer Jalasoft
- Product Manager and responsible for the business analytics area at Goja
- Assistant Business Intelligence Manager Pc's VIVA Nuevatel
- Responsible for the datrawarehouse and big data area at Viva
- Software Development Leader at Intersoft
- Licensed in Computer Science from the Mayor University of San Simon
- Doctorate in Computer Engineering Complutense University of Madrid
- Master's Degree in Computer Engineering from the Complutense University of Madrid
- Master's Degree in Information Systems and Technology Management from the Mayor University of San Simón
- International Instructor Oracle Database Proydesa - Oracle, Argentina
- Professional Certification in Project Management Scoup Consultancy, ChileDr. Almendras Aruzamen, Luis Fernando

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# Structure and Content

By employing the pedagogical methodology of *relearning* , TECH enables students to engage in their study work more effectively. This approach ensures that the most crucial concepts and fundamentals of Parallel and Distributed Computing are learned naturally and progressively throughout the program. This approach significantly reduces the time spent on the study itself, allowing students to allocate their efforts towards supplementary readings or practical exercises.

*A wide range of resources, including in-depth videos, overviews, motivational videos, and case studies, will be available to assist you in gaining a comprehensive understanding of the diverse applications of Parallel and Distributed Computing"*

## **Module 1.** Parallel Decomposition in Parallel and Distributed Computing

1.1. Parallel Decomposition
- 1.1.1. Parallel Processing:
- 1.1.2. Architecture
- 1.1.3. Supercomputers

1.2. Parallel Hardware and Parallel Software
- 1.2.1. Serial Systems
- 1.2.2. Parallel Hardware
- 1.2.3. Parallel Software
- 1.2.4. Input and Output
- 1.2.5. Performance

1.3. Parallel Scalability and Recurring Performance Issues
- 1.3.1. Parallelism
- 1.3.2. Parallel Scalability
- 1.3.3. Recurring Performance Issues

1.4. Shared Memory Parallelism
- 1.4.1. Shared Memory Parallelism
- 1.4.2. OpenMP and Pthreads
- 1.4.3. Shared Memory Parallelism Examples:

1.5. Graphics Processing Unit (GPU)
- 1.5.1. Graphics Processing Unit (GPU)
- 1.5.2. Computational Unified Device Architecture (CUDA)
- 1.5.3. Unified Computational Device Architecture (CUDA) 2.5.3. Examples:

1.6. Message Passing Systems
- 1.6.1. Message Passing Systems
- 1.6.1. MPI. Message Passing Interface
- 1.6.3. Message Passing Systems. Examples:

1.7. Hybrid Parallelization with MPI and OpenMP
- 1.7.1. Hybrid Programming
- 1.7.2. MPI/OpenMP Programming Models
- 1.7.3. Hybrid Decomposition and Mapping

1.8. MapReduce Computing
- 1.8.1. Hadoop
- 1.8.2. Other Computing Systems
- 1.8.3. Parallel Computing. Examples:

1.9. Model of Actors and Reactive Processes
- 1.9.1. Stakeholder Model
- 1.9.2. Reactive Processes
- 1.9.3. Actors and Reactive Processes. Examples:

1.10. Parallel Computing Scenarios
- 1.10.1. Audio and image processing
- 1.10.2. Statistics/Data Mining
- 1.10.3. Parallel Sorting
- 1.10.4. Parallel Matrix Operations

## **Module 2.** Parallel Computing Applied to Cloud Environments

2.1. Cloud Computing
- 2.1.1. State of the Art of the IT Landscape
- 2.1.2. The "Cloud"
- 2.1.3. Cloud Computing

2.2. Security and Resilience in the Cloud
- 2.2.1. Regions, Availability and Failure Zones
- 2.2.2. *Tenant* or *Cloud* Account Management
- 2.2.3. Cloud Identity and Access Control

2.3. Cloud *Networking*
- 2.3.1. Software-Defined Virtual Networks
- 2.3.2. Network Components of a Software-Defined Network
- 2.3.3. Connection with other Systems

2.4. Cloud Services
- 2.4.1. Infrastructure as a Service
- 2.4.2. Platform as a Service
- 2.4.3. Serverless Computing
- 2.4.4. Software as a Service



2.5. Cloud Storage
- 2.5.1. Block Storage in the Cloud
- 2.5.2. Block Storage in the Cloud
- 2.5.3. Block Storage in the Cloud

2.6. Block Storage in the Cloud
- 2.6.1. Cloud Monitoring and Management
- 2.6.2. Interaction with the Cloud: Administration Console
- 2.6.3. Interaction with Command Line Interface
- 2.6.4. API-Based Interaction

2.7. *Cloud-Native* Development
- 2.7.1. *Cloud* Native Development
- 2.7.2. Containers and Container Orchestration Platforms
- 2.7.3. Continuous Cloud Integration
- 2.7.4. Use of Events in the Cloud

2.8. Infrastructure as Code in the Cloud
- 2.8.1. Management and Provisioning Automation in the Cloud
- 2.8.2. Terraform
- 2.8.3. Scripting Integration

2.9. Creation of a Hybrid Infrastructure
- 2.9.1. Interconnection
- 2.9.2. Interconnection with Datacenter
- 2.9.3. Interconnection with other Clouds

2.10. High-Performance Computing
- 2.10.1. High-Performance Computing
- 2.10.2. Creation of a High-Performance Cluster
- 2.10.3. Application of High-Performance Computing

## **Module 3.** Parallel and Distributed Computing Applications

3.1. Parallel and Distributed Computing in Today's Applications
- 3.1.1. Hardware
- 3.1.2. Software
- 3.1.3. Importance of Timing

3.2. Climate. Climate Change
- 3.3.1. Climate Applications. Data Sources
- 3.3.2. Climate Applications. Data Volumes
- 3.3.3. Climate Applications. Real Time

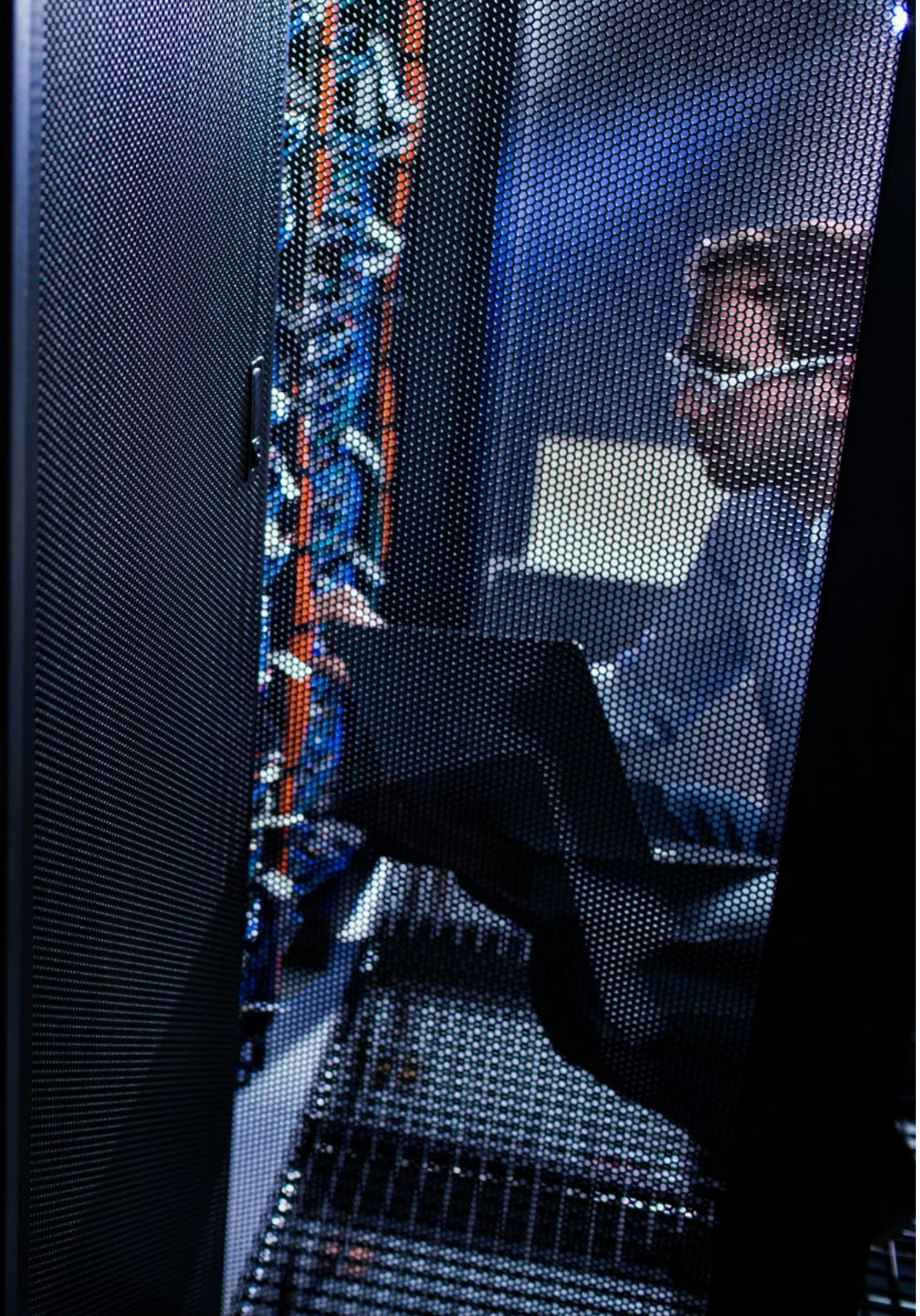
3.3. GPU Parallel Computing
- 3.3.1. GPU Parallel Computing
- 3.3.2. GPUs vs. CPU. GPU Usage
- 3.3.3. GPU. Examples:

3.4. *Smart Grid*. Computing in Power Grids
- 3.4.1. *Smart Grid*
- 3.4.2. Conceptual Models. Examples:
- 3.4.3. *Smart Grid*. Example

3.5. Distributed Engine. *ElasticSearch*
- 3.5.1. Distributed Engine. *ElasticSearch*
- 3.5.2. Architecture with ElasticSearch. Examples:
- 3.5.3. Distributed Engine. Case Uses

3.6. *Big Data Framework*
- 3.6.1. *Big Data Framework*
- 3.6.2. Architecture of Advanced Tools
- 3.6.3. *Big Data* in Distributed Computing

3.7. Memory Database
- 3.7.1. Memory Database
- 3.7.2. Redis Solution. Case Study
- 3.7.3. Deployment of Solutions With In-Memory Database





3.8. *Blockchain*
- 3.8.1. *Blockchain* Architecture. Components
- 3.8.2. Collaboration Between Nodes and Consensus
- 3.8.3. *Blockchain* Solutions. Implementations

3.9. Distributed Systems in Medicine
- 3.9.1. Architecture Components
- 3.9.2. Distributed Systems in Medicine. Operation
- 3.9.3. Distributed Systems in Medicine. Applications

3.10. Distributed Systems in the Aviation Sector
- 3.10.1. Architecture Design
- 3.10.2. Distributed Systems in the Aviation Sector. Functionalities of the components
- 3.10.3. Distributed Systems in the Aviation Sector. Applications

*Gain access to the finest educational technology provided by TECH, the world's largest online academic institution"*

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 has been the most widely used learning system among the world's leading Information Technology schools for as long as they have existed. 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 course, students 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

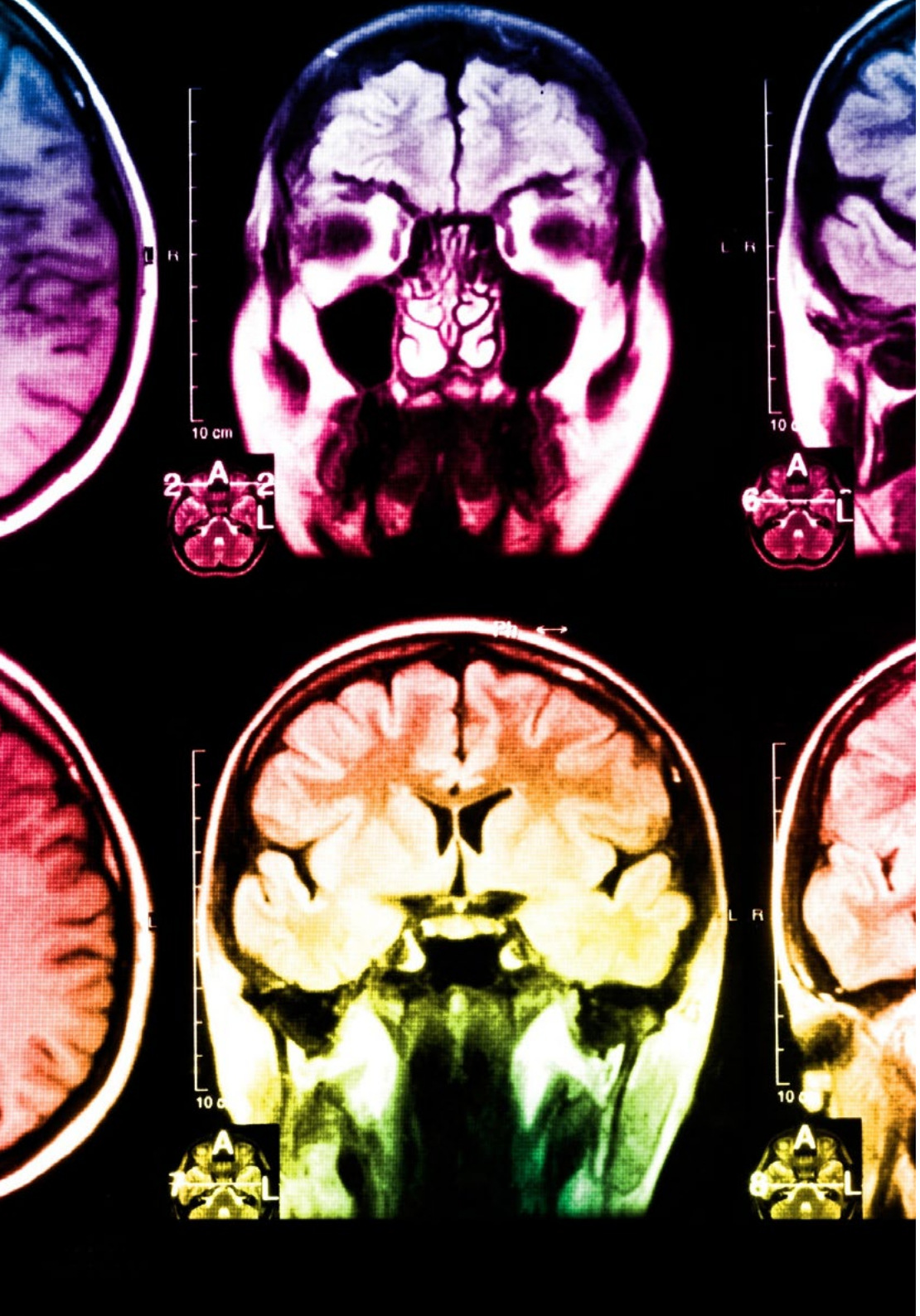
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines different teaching elements in each lesson.

We enhance the Case Study with the best 100% online teaching method: Relearning.

*In 2019, we obtained the best learning results of all online universities in the world.*

At TECH you will learn using a cutting-edge methodology designed to train the executives of the future. This method, at the forefront of international teaching, is called Relearning.

Our university is the only one in the world authorized to employ this successful method. In 2019, we managed to improve our students' overall satisfaction levels (teaching quality, quality of materials, course structure, objectives...) based on the best online university indicators.



In our program, learning is not a linear process, but rather a spiral (learn, unlearn, forget, and re-learn). Therefore, we combine each of these elements concentrically. This methodology has trained more than 650,000 university graduates with unprecedented success in fields as diverse as biochemistry, genetics, surgery, international law, management skills, sports science, philosophy, law, engineering, journalism, history, and financial markets and instruments. All this in a highly demanding environment, where the students have a strong socio-economic profile and an average age of 43.5 years.

*Relearning will allow you to learn with less effort and better performance, involving you more in your training, developing a critical mindset, defending arguments, and contrasting opinions: a direct equation for success.*

From the latest scientific evidence in the field of neuroscience, not only do we know how to organize information, ideas, images and memories, but we know that the place and context where we have learned something is fundamental for us to be able to remember it and store it in the hippocampus, to retain it in our long-term memory.

In this way, and in what is called neurocognitive context-dependent e-learning, the different elements in our program are connected to the context where the individual carries out their professional activity.

**This program offers the best educational material, prepared with professionals in mind:**

### Study Material

All teaching material is produced by the specialists who teach the course, specifically for the course, so that the teaching content is highly specific and precise.

These contents are then applied to the audiovisual format, to create the TECH online working method. All this, with the latest techniques that offer high quality pieces in each and every one of the materials that are made available to the student.

### Classes

There is scientific evidence suggesting that observing third-party experts can be useful.

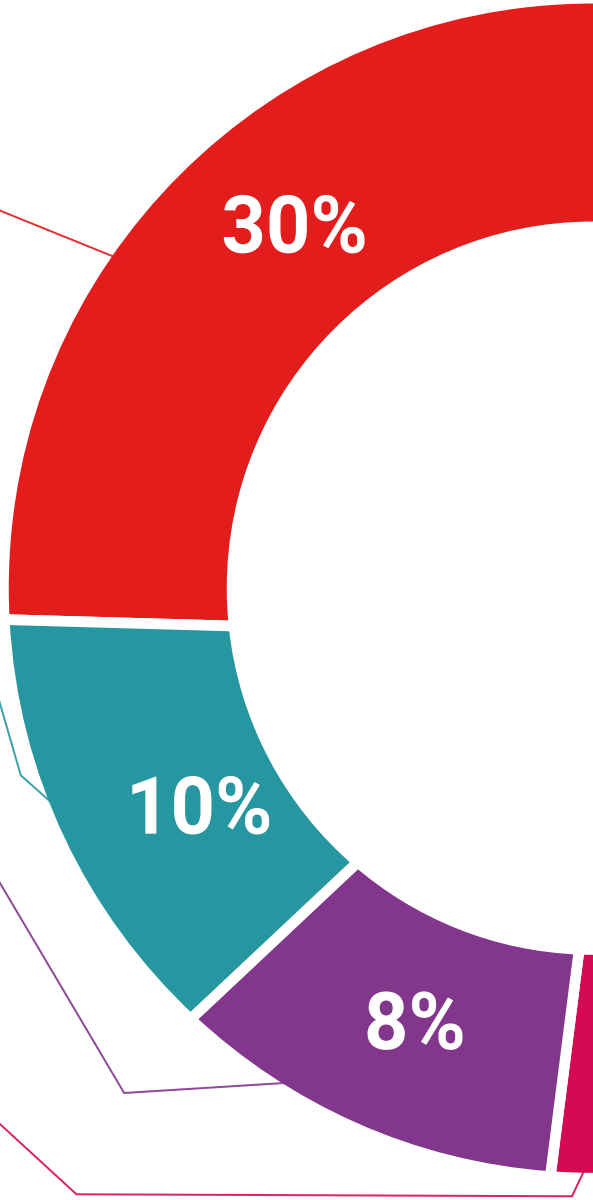
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

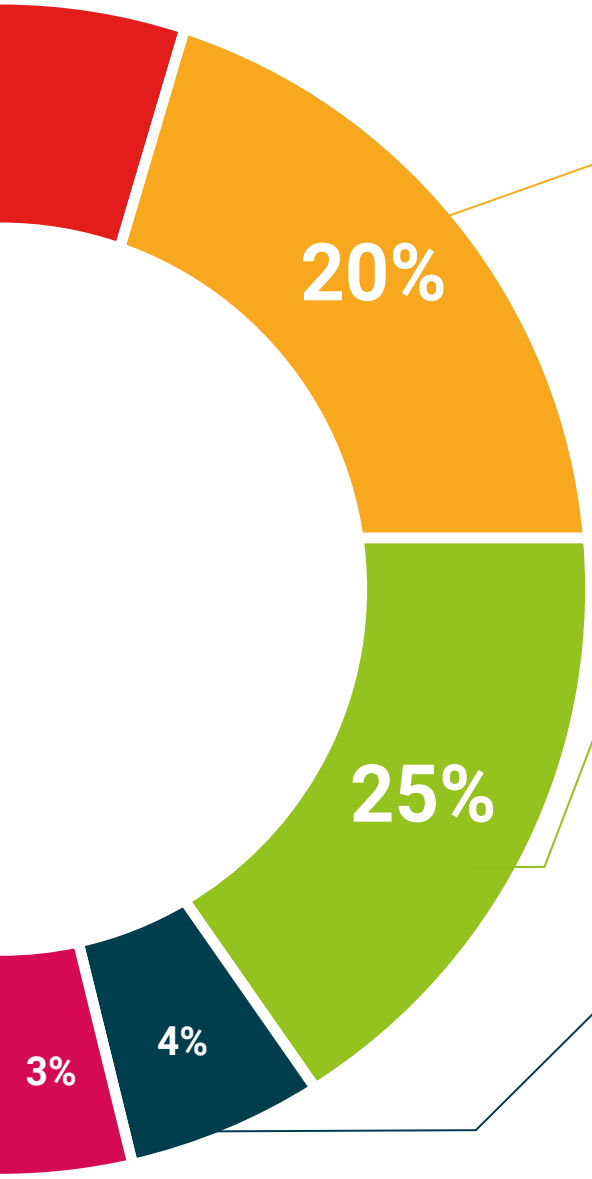
### Practising Skills and Abilities

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

### Additional Reading

Recent articles, consensus documents and international guidelines, among others. In TECH's virtual library, students will have access to everything they need to complete their course.






### Case Studies

Students will complete a selection of the best case studies chosen specifically for this program. Cases that are presented, analyzed, and supervised by the best specialists in the world.

### Interactive Summaries

The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

This exclusive educational system for presenting multimedia content was awarded by Microsoft as a "European Success Story".

### Testing & Retesting

We periodically evaluate and re-evaluate students' knowledge throughout the program, through assessment and self-assessment activities and exercises, so that they can see how they are achieving their goals.

06

# Certificate

The Postgraduate Diploma in Parallel and Distributed Computing offers the assurance of rigorous and up-to-date training, along with the opportunity to earn a certificate issued by TECH, Technological University.

*By successfully completing this program, you can obtain your university qualification conveniently, without the need to travel or engage in laborious paperwork"*

The **Postgraduate Diploma in Parallel and Distributed Computing** 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 Parallel and Distributing Computing**

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

Parallel and Distributing Computing

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

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.


tech technological university
Postgraduate Diploma
Parallel and Distributed Computing
» Modality: online
» Duration: 6 months
» Certificate: TECH Technological University
» Dedication: 16h/week
» Schedule: at your own pace
» Exams: online

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