# Postgraduate Certificate
## Analysis and Programming of Parallel Algorithms

tech technological university

# Postgraduate Certificate
## Analysis and Programming of Parallel Algorithms

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

Website: **www.techtitute.com/pk/information-technology/postgraduate-certificate/analysis-programming-parallel-algorithms**

# Index

# 01
# Introduction

Supercomputers, smartphones, televisions, personal computers almost every facet of today's technology, for professional or personal use, harnesses the power of parallel computing in various ways. More than ever, computer scientists are looking for innovation and development through better and more refined software parallelization techniques. This progress unlocks a vast array of growth possibilities, leading this program to prioritize the exploration of different ways to analyze and program parallel algorithms. The invaluable expertise of the teaching staff, well-versed in the subject matter, offers computer scientists a crucial edge, ensuring they gain a substantial professional advantage upon completion of this program.

"

*With the knowledge and tools provided by this Diploma, you can elevate your professional career to unprecedented heights, unlocking remarkable opportunities for growth and success"*

The development of new software parallelization algorithms necessitates computer scientists who possess extensive training and specialized expertise in their analysis and programming techniques. Moreover, there is a significant amount of work involved in adapting existing algorithms to the new capabilities of different hardware, which is why this field is currently booming.

The essential knowledge that computer science professionals need to specialize in this field encompasses a comprehensive understanding of Parallel Programming Paradigms, key parallel algorithms, and the prevalent tools utilized in their programming.

This Diploma delves into all these aspects and further expands them with dedicated topics on OpenMP, MPI, Shared Memory Parallel Programming, as well as OpenCL and CUDA, among other relevant subjects. These topics are invaluable for any IT professional seeking to specialize in Parallel Computing.

The online format of the program facilitates the integration of various activities and personal responsibilities. There are no in-person classes or rigid schedules in this program. Instead, all the educational materials for the certificate are available for download from the very beginning.  The students have the freedom to adapt the course load to their own pace.

This **Postgraduate Certificate in Analysis and Programming of Parallel Algorithms** contains the most complete and up-to-date program on the market. The most important features include:

- The program includes the development of case studies presented by experts in Parallel and Distributed Computing

- The program is designed with graphic, schematic, and highly practical content, providing essential information on disciplines that are crucial for professional practice. These practical resources offer valuable insights and skills relevant to real-world applications

- Practical exercises where the self-assessment process can be carried out to improve learning

- Its special emphasis on innovative methodologies

- The program incorporates theoretical lessons, interactive question-and-answer sessions with experts, and individual reflection assignments

- Participants have the convenience of accessing the program's contents from any fixed or portable device with an internet connection

*At TECH, you won't have to attend in-person classes or adhere to fixed schedules. You will be the one who decides the schedule and when to study each topic"*

*Leveraging the support of TECH, the world's largest online academic institution, which provides you with the most innovative educational and technological resources"*

*Uncover the intriguing secrets and advantages of parallel programming and incorporate them into your daily work to differentiate yourself from the competition.*

*Achieve access to the cutting-edge Parallel Algorithm Design, equipped with extensive expertise in OpenCL, CUDA, and OpenMP.*
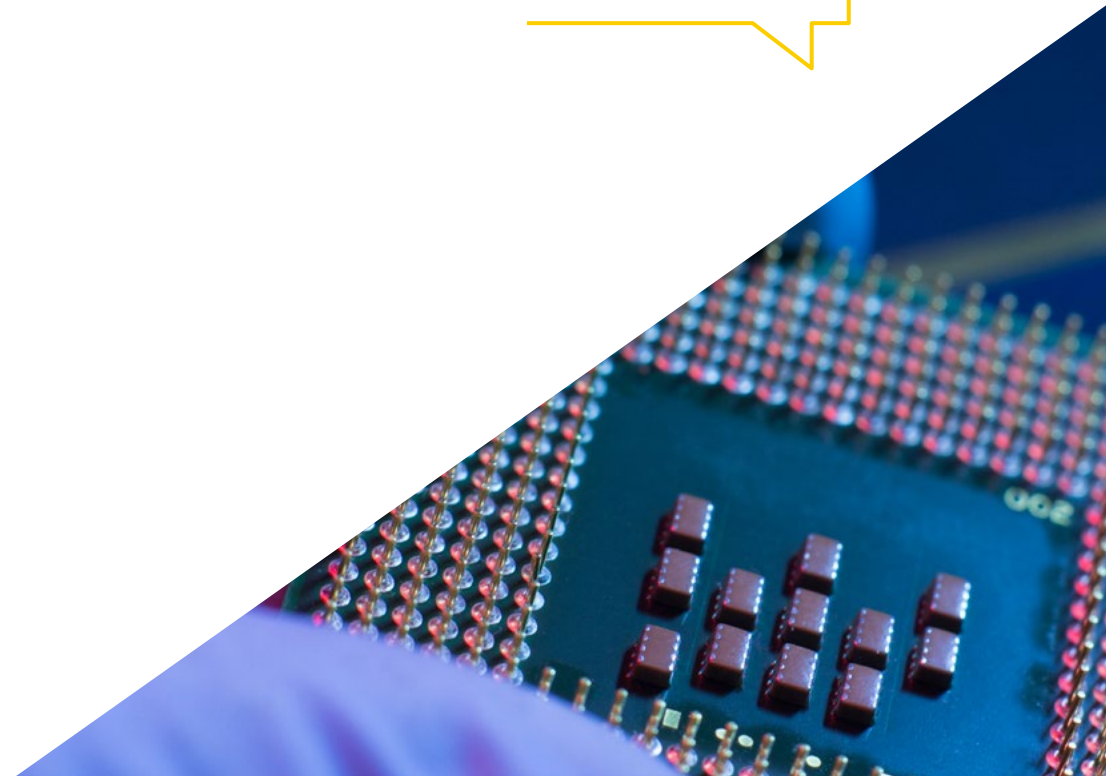
The program features a teaching staff comprising professionals from the industry who bring their valuable work experience to the training. Additionally, renowned specialists from prestigious reference societies and universities contribute their expertise to further enrich the program.

The program offers multimedia content developed using the latest educational technology, creating a contextual and immersive learning environment for professionals. This includes a simulated environment designed to provide training in real-life situations.

The program is designed with a focus on problem-based learning, where professionals are tasked with solving various real-life professional practice situations that arise throughout 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

The primary aim of this degree is to offer computer science professionals a comprehensive and thorough overview of all the analysis and programming processes involved in parallel computing. By doing so, graduates will be able to specialize their careers in a specific field of development and even explore novel approaches to enhance current or future software and hardware processes.

*"Even before completing this Diploma, you will have the opportunity to integrate the advanced knowledge you acquire into your daily professional practice"*

## General Objectives

- Analyze the interactions among the various components of Parallel and Distributed Computing

- Evaluate and compare the efficiency of the employed set of components to analyze their overall performance

- Thoroughly analyze cross-platform parallel computing to leverage task-level parallelism across different hardware accelerators

- Analyze in detail current software and architectures

- Develop in depth the relevant aspects of Parallel and Distributed Computing

- Specialize the student in the use of Parallel and Distributed Computing in different sectors

## Specific Objectives

◆ Analyze the different Parallel Programming paradigms

◆ Examine the most advanced tools to perform Parallel Programming

◆ Analyze parallel algorithms for fundamental problems

◆ Specify the design and analysis of parallel algorithms

◆ Develop parallel algorithms and implement them using MPI, OpenMP, OpenCL/CUDA

*By dedicating yourself to continuous updating and academic improvement, supported by the best instructors at TECH, you will be able to elevate your career to the job position you truly deserve"*

# 03
# Course Management

The teaching staff responsible for developing the program's contents has been meticulously chosen by TECH based on their vast experience in leading numerous international IT projects. This selection ensures that the program not only maintains a unique level of quality but also offers a balanced blend of practical and theoretical approaches, essential for computer professionals to graduate with the most sought after knowledge in today's market.

*With the guidance of professionals who understand the path to success in the IT industry, you will attain the career advancement you desire"*

## Management

### Mr. 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

**Mr. Villot Guisán, Pablo**
- Chief Information Officer, Chief Technical Officer and Founder of New Tech & Talent
- Technology Expert at KPMG Spain
- *Blockchain* Architect at Everis
- J2EE Developer Commercial Logistics Area in Inditex
- Degree in Computer Engineering from the University of La Coruña
- Microsoft MSCA certification: *Cloud Platform*
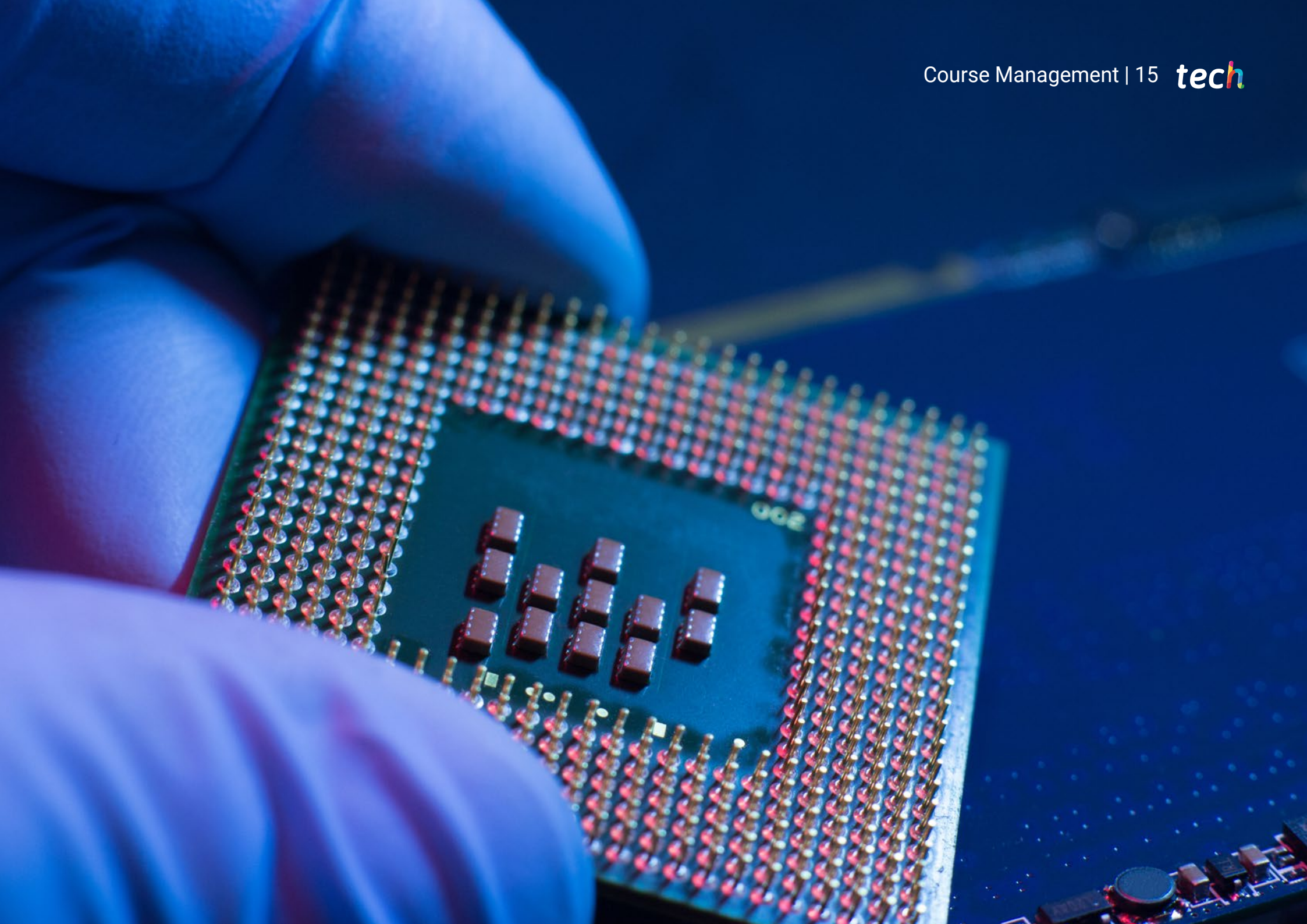
# 04
# Structure and Content

By incorporating the *relearning* into this degree, students guarantee a progressive and organic learning experience of the essential terms and concepts related to parallel algorithm programming. The program offers a wide array of educational materials, including real-life examples provided by the teaching team. This comprehensive range of resources contributes to an exceptional academic program that is rigorous, comprehensive, and specifically designed to align with the current IT landscape.
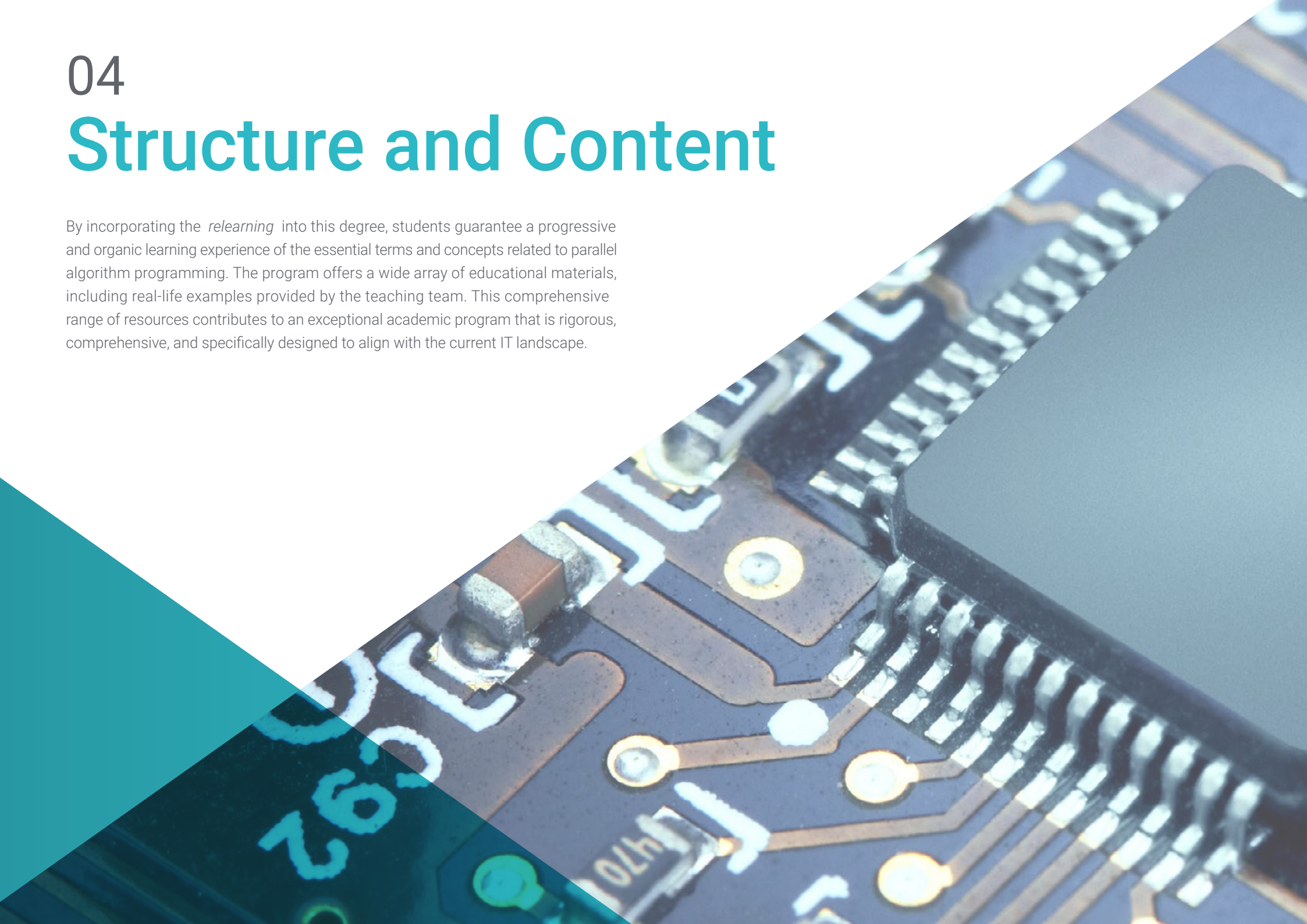
*The detailed videos, video summaries, and other audiovisual materials will greatly help you alleviate the academic workload of the entire syllabus"*

## Module 1. Analysis and Programming of Parallel Algorithms

1.1.    Parallel Algorithms
    1.1.1.    Problem Decomposition
    1.1.2.    Data Dependencies
    1.1.3.    Implicit and Explicit Parallelism

1.2.    Parallel Programming Paradigms
    1.2.1.    Parallel Programming with Shared Memory
    1.2.2.    Parallel Programming with Distributed Memory
    1.2.3.    Hybrid Parallel Programming
    1.2.4.    Heterogeneous Computing- CPU + GPU
    1.2.5.    Quantum Computing New Programming Models with Implicit Parallelism.

1.3.    Parallel Programming with Shared Memory
    1.3.1.    Models of Parallel Programming with Shared Memory.
    1.3.2.    Parallel Algorithms with Shared Memory
    1.3.3.    Libraries for Parallel Programming with Shared Memory

1.4.    OpenMP
    1.4.1.    OpenMP
    1.4.2.    Running and Debugging Programs with OpenMP
    1.4.3.    Parallel Algorithms with Shared Memory in OpenMP

1.5.    Parallel Programming by Message Passing
    1.5.1.    Message Passing Primitives
    1.5.2.    Communication Operations and Collective Computing
    1.5.3.    Parallel Message-Passing Algorithms
    1.5.4.    Libraries for Parallel Programming with Message Passing

*You will find complementary readings and practical exercises for each of the topics provided.*

## 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.*

## 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.

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

## 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.

01 learning from evidence

02 relearning from evidence

03 testing

04 learning from an expert

05 neurocognitive context dependent learning

06 Von-Restorff effect

07 case based learning through storytelling

08 competencies testing (retesting)

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.

**30%**

**10%**

**8%**

**20%**

**25%**

**4%**

**3%**
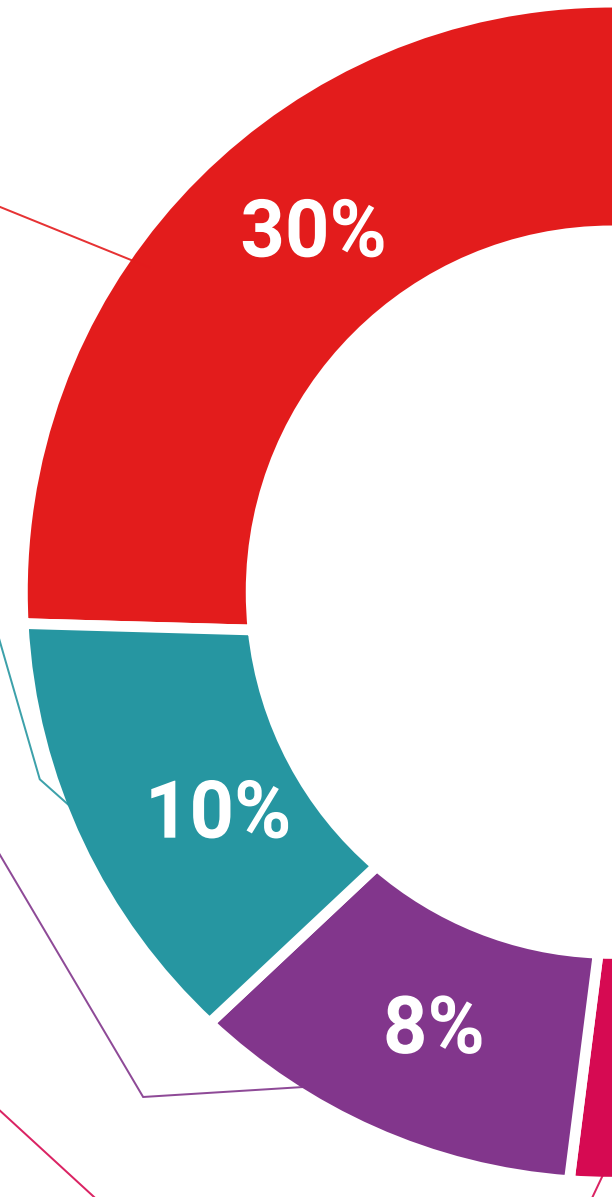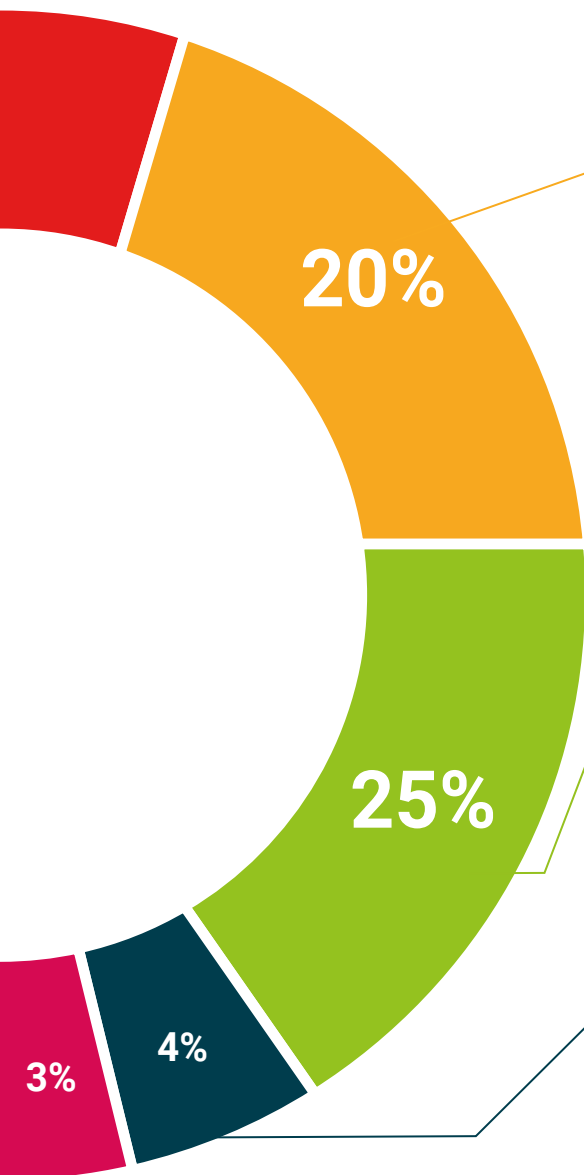
### Case Studies

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 Certificate in Analysis and Programming of Parallel Algorithms guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate issued by TECH Technological University.

*By successfully completing this program, you can obtain your certificate and without the need for travel or dealing with cumbersome paperwork"*

This **Postgraduate Certificate in Analysis and Programming of Parallel Algorithms** contains the most complete and up-to-date program on the market.

After the student has passed the assessments, they will receive their corresponding **Postgraduate Certificate** issued by TECH Technological University via tracked delivery*.

The certificate issued by **TECH Technological University** will reflect the qualification obtained in the Postgraduate Certificate, and meets the requirements commonly demanded by labor exchanges, competitive examinations, and professional career evaluation committees.

Title: **Postgraduate Certificate in Analysis and Programming of Parallel Algorithms**
Official Nº of Hours: **150 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

Analysis and Programming of Parallel Algorithms

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 certificate issued with an apostille, TECH EDUCATION will make the necessary arrangements to obtain it, at an additional cost.

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