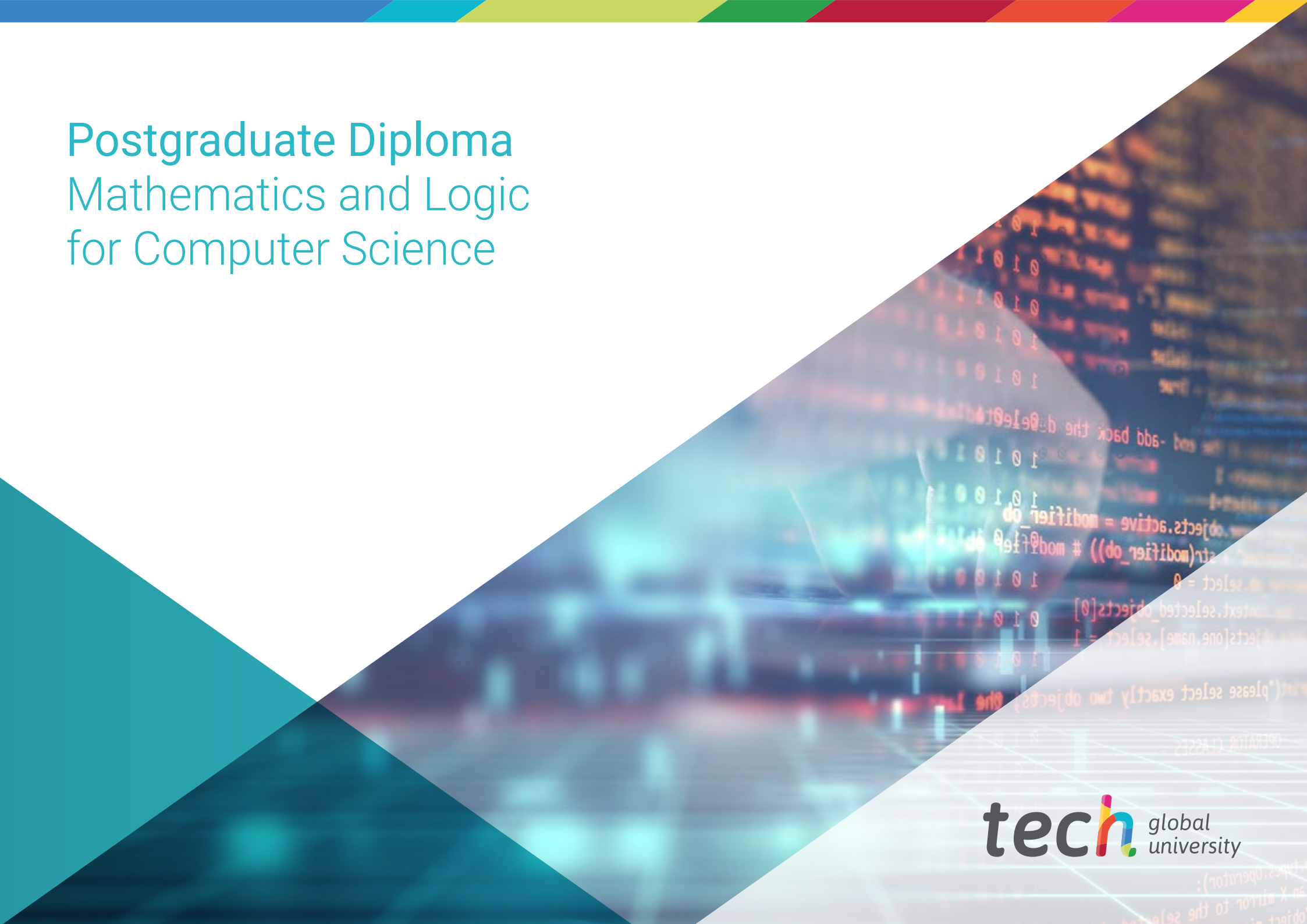
Postgraduate Diploma
Mathematics and Logic for Computer Science



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Postgraduate Diploma
Mathematics and Logic for Computer Science

- Modality: **online**
- Duration: **6 months**
- Certificate: **TECH Global University**
- Credits: **24 ECTS**
- Schedule: **at your own pace**
- Exams: **online**

Website: www.techtitute.com/us/information-technology/postgraduate-diploma/postgraduate-diploma-mathematics-logic-computer-science

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01

Introduction

This Postgraduate Diploma is oriented to achieve a high mastery of Mathematics and Logic for Computer Science, through the latest educational technology 100% Online, in order to update the knowledge in a practical and rigorous way, from the hand of professionals with extensive experience in the field.

This Postgraduate Diploma will allow you to update your knowledge about Mathematics and Logic for Computer Science in a practical way, 100% online, without renouncing to the maximum academic rigor"

This program is aimed at those people interested in achieving a higher level of knowledge in Mathematics and Logic for Computer Science. The main objective of this Postgraduate Diploma is for students to specialize their knowledge in simulated work environments and conditions in a rigorous and realistic manner so that they can later apply it in the real world.

This Postgraduate Diploma will prepare students for the professional practice of Computer Engineering, thanks to a transversal and versatile Training adapted to new technologies and innovations in this field. You will obtain extensive knowledge in Mathematics and Logic for Computer Science, from professionals in the sector.

The professional should take advantage of the opportunity and take this training in a 100% Online format, without having to give up their obligations, and making it easy for them to return to university. Update your knowledge and obtain a Postgraduate Diploma to continue growing both personally and professionally.

This **Postgraduate Diploma in Mathematics and Logic for Computer Science** contains the most complete and up-to-date program on the market. The most important features include:

- The development of 100 simulated scenarios presented by experts in Mathematics and Logic for Computer Science
- The graphical, schematic and eminently practical contents of the book provide scientific and practical information on Mathematics and Logic for Computer Science
- Updates on the latest developments in Mathematics and Logic for Computer Science
- Practical exercises where self-assessment can be used to improve learning
- Interactive learning system based on the case method and its application to real practice
- All of this will be complemented by 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

This program will allow you to enhance your skills and update your knowledge in Mathematics and Logic for Computer Science"

Learn the latest techniques and strategies with this program and achieve success as a computer scientist"

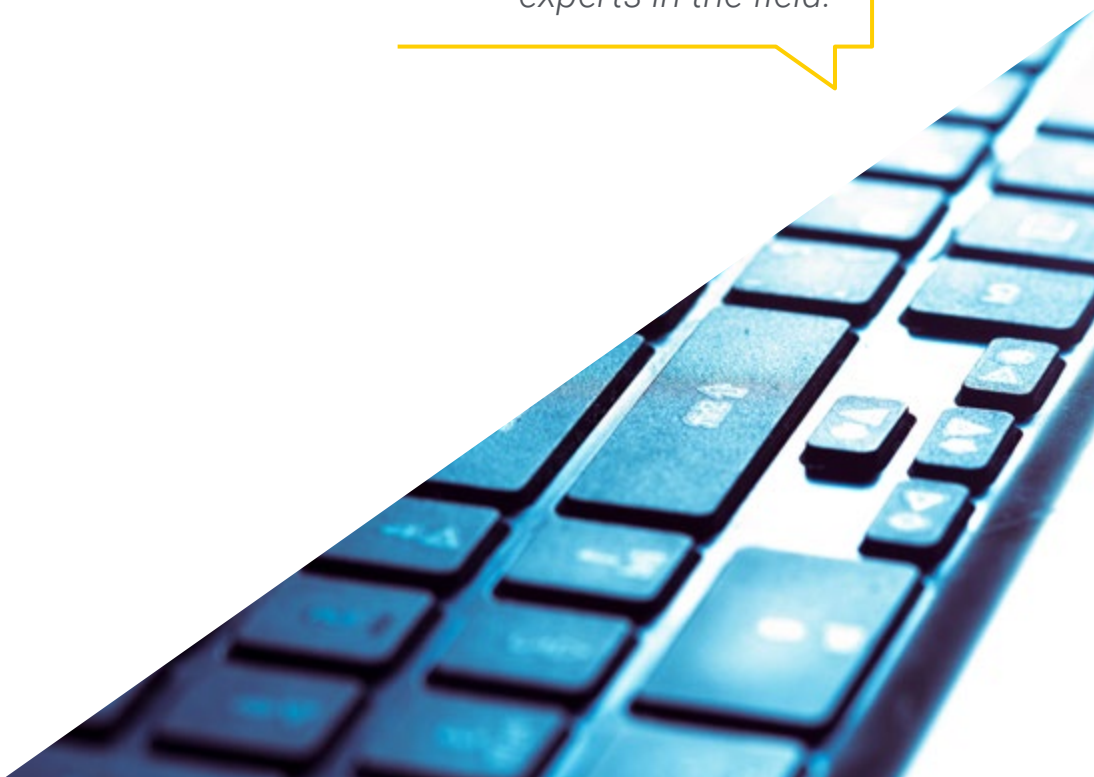
Take advantage of the latest educational technology to get up to date in Mathematics and Logic for Computer Science without leaving home.

Learn the latest techniques in Mathematics and Logic for Computer Science from experts in the field.

It includes in its teaching staff a team of professionals belonging to the field of Computer Engineering, who bring to this training the experience of their work, in addition to recognized specialists belonging to reference 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 an immersive training program designed 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 throughout the program. For this purpose, the professionals will be assisted by an innovative interactive video system created by recognized experts in Information System with extensive teaching experience.



02

Objectives

The objective of this program is to provide IT professionals with the knowledge and skills necessary to carry out their activity using the most advanced protocols and techniques of the moment. Through a work approach that is totally adaptable to the students, this Postgaduate Diploma will progressively lead them to acquire the competencies that will propel them to a higher professional level.

Achieve professional success as an IT professional with this intensive program, developed by professionals with extensive experience in the sector"

General Objectives

- Prepare scientifically and technologically, as well as preparing for the professional practice of Computer Engineering, all with a transversal and versatile academic experience adapted to new technologies and innovations in this field
- Obtain a broad knowledge in the field of computing, computer structure and software engineering, including the mathematical, statistical and physical basis essential in computer science

A way of training and professional growth that will also provide you with greater competitiveness in the "job market"

Specific Objectives

Module 1. Algebra and discrete mathematics

- To know different methods of mathematical proof or demonstration, as well as the use of variables and quantifiers
- To deepen in the use of sets and functions, since their use is fundamental in Computer Science studies
- To learn the theory of numbers that allows to deepen in the handling of numbers, knowing the essential elements of this part of Mathematics
- To know in depth the operations on matrixes, since these will be a substantial part of the data structures used in all types of computer programs
- To learn the basics of linear programming and optimization, as well as some of its main algorithms
- To establish the basis of graph and tree theory, as well as the different varieties of graphs and trees and their applications

Module 2. Calculus and numerical methods

- To set the foundations of calculus and numerical analysis, starting with the essential concepts such as functions, limits and their calculations
- To assimilate the theory of function derivation and its essential applications, the main interpretations and theorems of derivable functions
- To understand the behavior of definite and indefinite integrals, knowing the properties of each of them, as well as the main methods and theorems
- To learn the essential concepts of successions and finite series, as well as the fundamental principles of counting
- To understand numerical and error analysis, as well as the main existing numbering systems and error propagation
- To know the main algorithms for root calculation and interpolation, as well as resolution and acceleration techniques

Module 3. Statistics

- To explain the basic concepts of statistics and probability in order to apply the different methods of selection, grouping and presentation of data
- To design and select samples by identifying the means, techniques and tools to record information

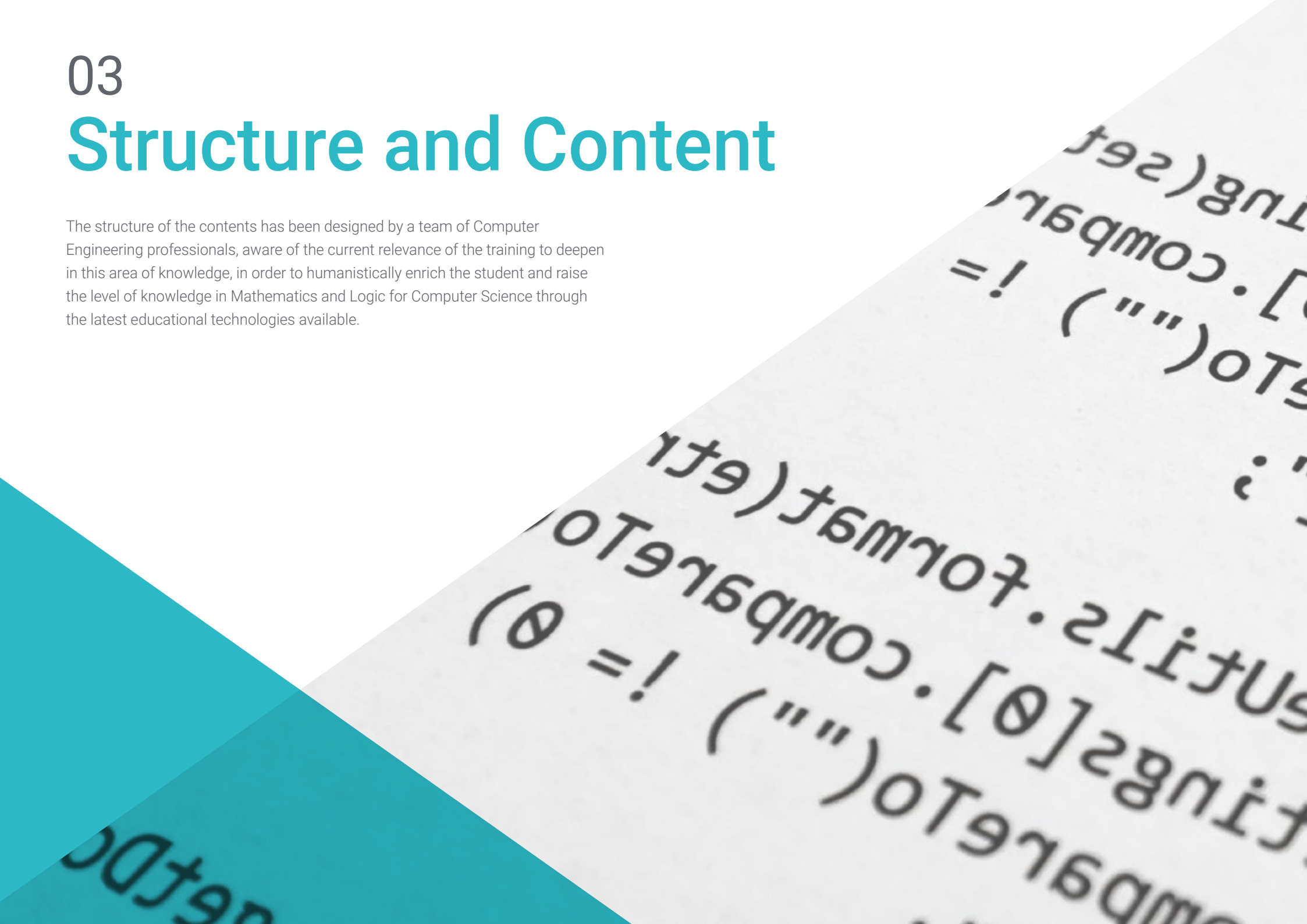
Module 4. Logic in Computer Science

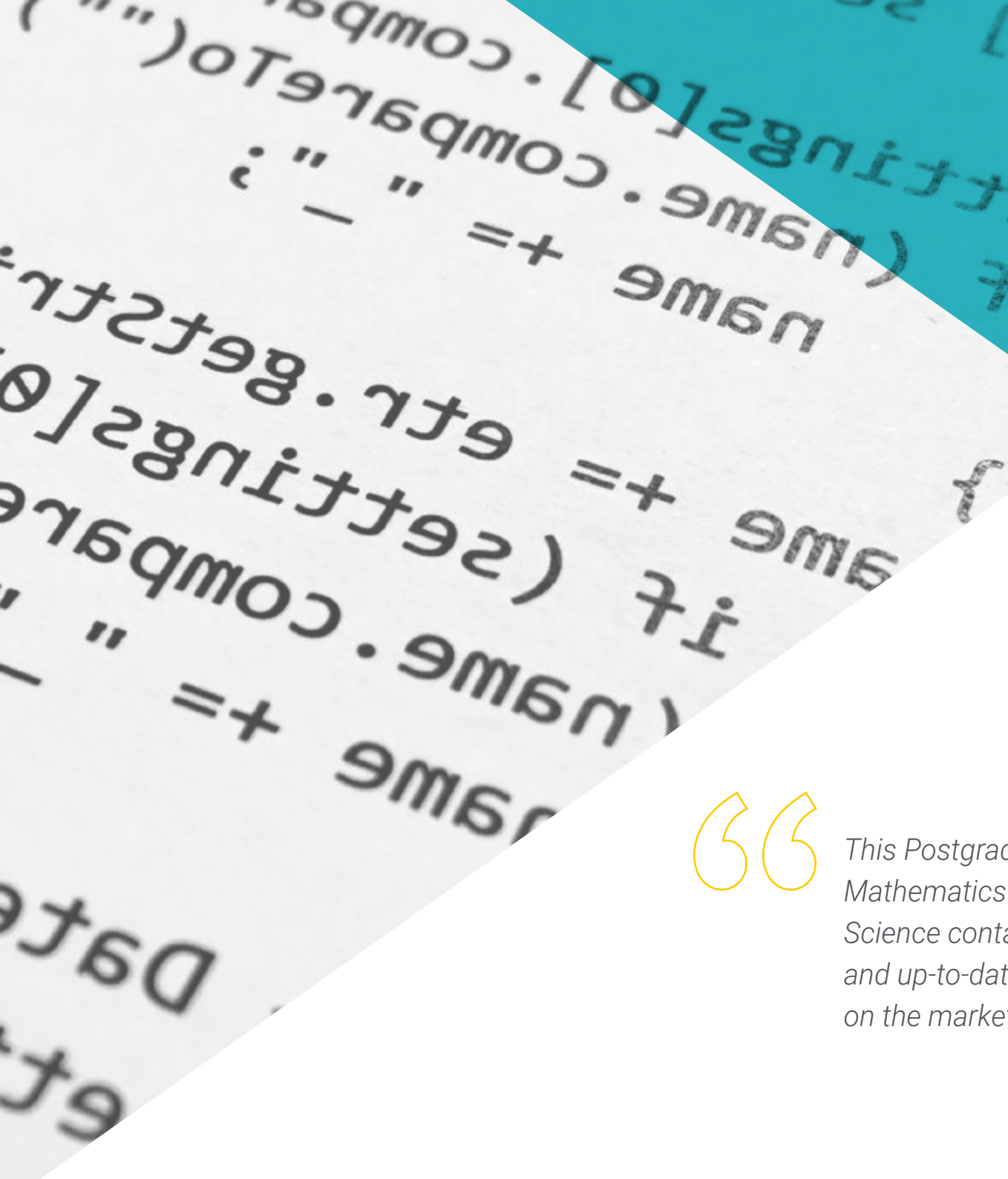
- To learn the fundamentals of computational logic, what it is used for and its justification of use
- To know the different strategies of formalization and deduction in propositional logic, including natural reasoning, axiomatic and natural deduction, as well as the primitive rules of propositional calculus
- To acquire advanced knowledge in propositional logic, delving into its semantics and the main applications of this logic, such as logic circuits
- To understand predicate logic both for the calculation of natural deduction of predicates and for the formalization and deduction strategies for predicate logic
- To understand the basics of natural language and its deductive mechanism
- Introduction logic programming using the PROLOG language

03

Structure and Content

The structure of the contents has been designed by a team of Computer Engineering professionals, aware of the current relevance of the training to deepen in this area of knowledge, in order to humanistically enrich the student and raise the level of knowledge in Mathematics and Logic for Computer Science through the latest educational technologies available.





This Postgraduate Diploma in Mathematics and Logic for Computer Science contains the most complete and up-to-date educational program on the market"

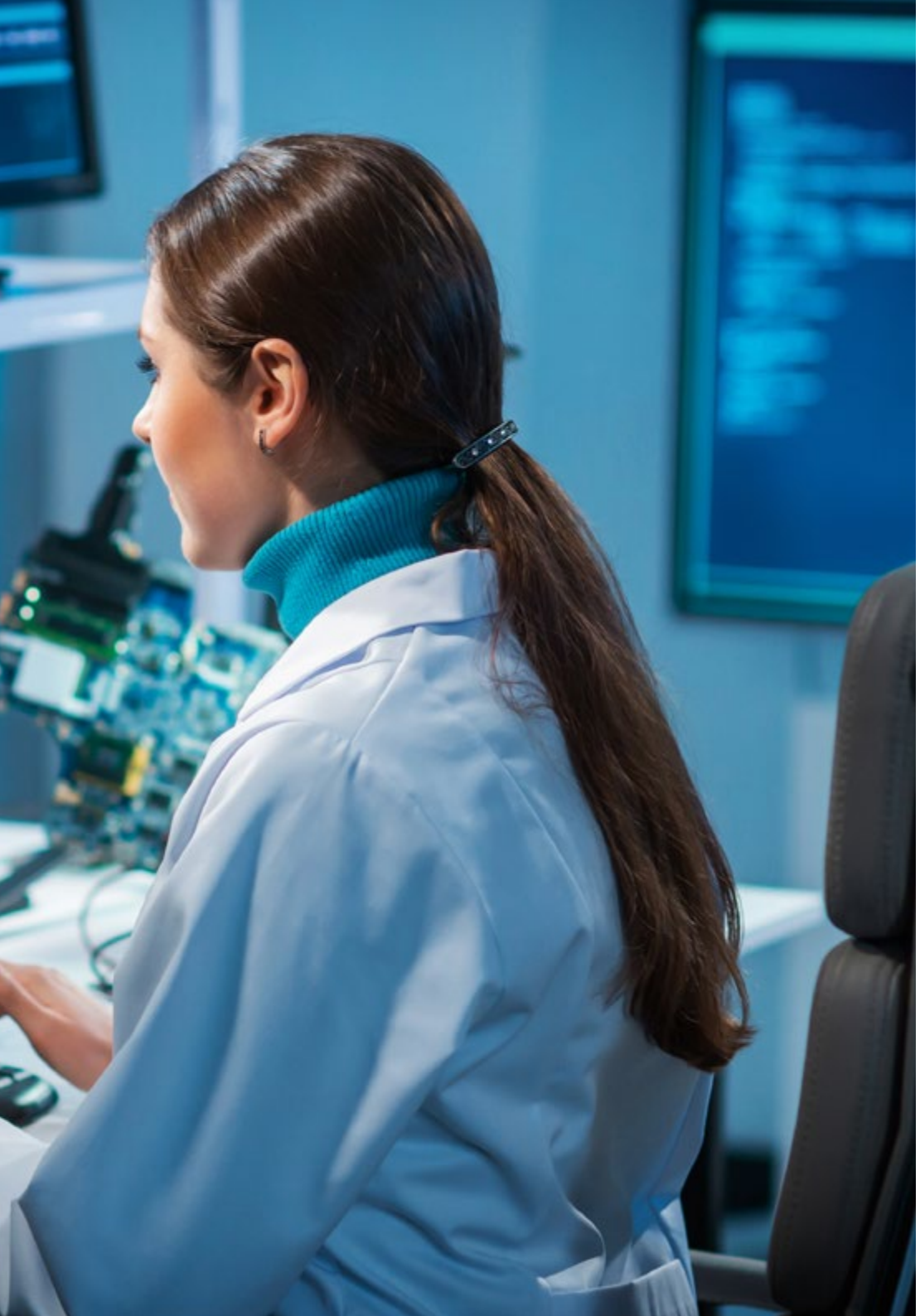
Module 1. Algebra and discrete mathematics

1.1. Methods of test, induction and recursion
- 1.1.1. Variables and quantifiers
- 1.1.2. Test methods
- 1.1.3. Induction
- 1.1.4. Recursion

1.2. Sets and Functions
- 1.2.1. Sets
- 1.2.2. Operations with sets
- 1.2.3. Functions
- 1.2.4. Cardinality

1.3. Number theory and modular arithmetic
- 1.3.1. Divisibility and modular arithmetic
- 1.3.2. Prime numbers
- 1.3.3. Greatest Common Divisor and Least Common Multiple
- 1.3.4. Linear congruencies
- 1.3.5. Chinese remainder theorem
- 1.3.6. Fermat's little theorem
- 1.3.7. Primitive root and discrete logarithm
- 1.3.8. Diffie-Hellman Algorithm

1.4. Matrix Operations
- 1.4.1. Concept of Matrix
- 1.4.2. Fundamental matrix operations
- 1.4.3. The matrix identity and the power of a matrix
- 1.4.4. The zero-one matrixes
- 1.4.5. The transposed matrix, inverse and determinant



1.5. Relationships
- 1.5.1. Binary relationships and their properties
- 1.5.2. N-Ary Relationships
- 1.5.3. Representation of relationships
- 1.5.4. Closure of a relationship

1.6. Gaussian elimination
- 1.6.1. Automatic solving of equation systems
- 1.6.2. Naive Gaussian elimination
- 1.6.3. Error vector and residual vector
- 1.6.4. Gaussian elimination with scaled partial pivoting

1.7. Lineal Programming
- 1.7.1. -Lineal Programming Problems
- 1.7.2. Standard form
- 1.7.3. Distensioned form
- 1.7.4. Duality

1.8. Simplex algorithm
- 1.8.1. What is the simplex algorithm?
- 1.8.2. Geometric Interpretation
- 1.8.3. Pivoting
- 1.8.4. Initialization
- 1.8.5. Algorithm body

1.9. Graphs
- 1.9.1. Introduction to Graphs
- 1.9.2. Neighborly relations
- 1.9.3. Graph representation
- 1.9.4. Isomorphic graphs
- 1.9.5. Connectivity in networks

1.10. Tree
- 1.10.1. Introduction to Tree
- 1.10.2. Application of Tree
- 1.10.3. Tree Paths

Module 2. Calculus and numerical methods

2.1. Introduction to Analysis
- 2.1.1. Concept from Functions
- 2.1.2. Concept of limit
- 2.1.3. Calculation of limits
- 2.1.4. Continuity of functions

2.2. Derivation of functions and their applications
- 2.2.1. Derivative of a function
- 2.2.2. Geometric Interpretation
- 2.2.3. Physical interpretation
- 2.2.4. Calculation of derivatives
- 2.2.5. Successive derivatives
- 2.2.6. Derivable functions. Lateral derivatives
- 2.2.7. Theorems of derivable functions
- 2.2.8. L'Hôpital Rule
- 2.2.9. Relative extremes and monotony
- 2.2.10. Inflection points and curvature
- 2.2.11. Optimization problems

2.3. Study and graphical representation of functions of one variable
- 2.3.1. Study of a function
- 2.3.2. Study of polynomial functions
- 2.3.3. Study of Rational Functions
- 2.3.4. Study of irrational functions
- 2.3.5. Study of exponential functions
- 2.3.6. Study of Logarithm Functions
- 2.3.7. Study of trigonometric functions
- 2.3.8. Construction of functions from other known functions

2.4. Definite Integrals
- 2.4.1. The definite integral as the limit of a sum
- 2.4.2. Properties of the definite integral
- 2.4.3. Immediate Integrals
- 2.4.4. Mean value theorem of integral calculus
- 2.4.5. Fundamental Calculus Theorem. Barrow's Rule
- 2.4.6. Areas of flat enclosures
- 2.4.7. Arc length of a curve
- 2.4.8. Volumes of solid bodies

2.5. Indefinite integral
- 2.5.1. Concept of Primitives of a Function
- 2.5.2. Properties of the indefinite integral
- 2.5.3. Integration by Parts
- 2.5.4. Integration of Rational Functions
- 2.5.5. Integration by variable change
- 2.5.6. Integration by trigonometric substitutions
- 2.5.7. Non-elemental integrals

2.6. Finite sequences and series
- 2.6.1. Successions of Real Numbers
- 2.6.2. Sets
- 2.6.3. The integral criterion and the comparison criterion
- 2.6.4. Alternating series
- 2.6.5. Absolute convergence and quotient criterion

2.7. Fundamental principles of counting
- 2.7.1. Partitioning of a set
- 2.7.2. Addition principle
- 2.7.3. Multiplication principle
- 2.7.4. Inclusion- Exclusion Principles
- 2.7.5. Distribution principle

2.8. Numerical and error analysis
- 2.8.1. Origin and Evolution of Numerical Analysis
- 2.8.2. Algorithms
- 2.8.3. Types of Error
- 2.8.4. Convergence

2.9. Numbering Systems
- 2.9.1. Information representation
- 2.9.2. Introduction to numerical systems
- 2.9.3. Conversion from decimal system to base b
- 2.9.4. Arithmetic operations in base b
- 2.9.5. Conversion from b1 to b2 system
- 2.9.6. Representation of numbers
- 2.9.7. Floating point arithmetic
- 2.9.8. Error propagation

2.10. Root computation and interpolation, solving algorithms and acceleration techniques
- 2.10.1. Bisection algorithm
- 2.10.2. Fixed-point algorithm
- 2.10.3. Secant Method
- 2.10.4. Newton-Raphson algorithm
- 2.10.5. Modified secant algorithm
- 2.10.6. Newton modified algorithm
- 2.10.7. Δ2 of Aitken
- 2.10.8. Steffersen Algorithm

Module 3. Statistics

3.1. Introduction to Statistics
- 3.1.1. Basic Concepts
- 3.1.2. Types of Variables
- 3.1.3. Statistical Information

3.2. Data Record Sorting and Classifying
- 3.2.1. Description of Variables
- 3.2.2. Frequency Distribution Table
- 3.2.3. Quantitative and Qualitative Frequency Distribution Tables

3.3. ICT Applications and Practical Systems
- 3.3.1. Basic Concepts
- 3.3.2. Data Science
- 3.3.3. Data Representation

3.4. Summary Statistics I
- 3.4.1. Descriptive Statistics
- 3.4.2. Centralization Measurements
- 3.4.3. Measures of Dispersion
- 3.4.4. Measures of Shape and Position

3.5. Summary Statistics II
- 3.5.1. Box Plots
- 3.5.2. Identifying Outliers
- 3.5.3. Transformation

3.6. Statistical Analysis of the Relationship between the Two Variables
- 3.6.1. Tabulation
- 3.6.2. Contingency Tables and Graphical Representations
- 3.6.3. Linear Relationship between Quantitative Variables

3.7. Time Series and Index Numbers
- 3.7.1. Time Series
- 3.7.2. Rates of Change
- 3.7.3. Index Numbers
- 3.7.4. Consumer Prices Index (CPI) and Deflated Time Series

3.8. Introduction to Probability: Calculation and Basic Concepts
- 3.8.1. Basic Concepts
- 3.8.2. Set Theory
- 3.8.3. Probability Calculation

3.9. Random Variables and Probability Distributions
- 3.9.1. Random Variables
- 3.9.2. Variable Measurements
- 3.9.3. Function of Probability

3.10. Probability Models for Random Variables
- 3.10.1. Probability Calculation
- 3.10.2. Discrete Random Variables
- 3.10.3. Continuous Random Variables
- 3.10.4. Models Derived from Normal Distribution

Module 4. Logic in Computer Science

4.1. Justification of the Logic
- 4.1.1. Object of Logic Study
- 4.1.2. What Is Logic for?
- 4.1.3. Components and Types of Reasoning
- 4.1.4. Components of a Logic Calculation
- 4.1.5. Semantics
- 4.1.6. Justification of the Existence of a Logic
- 4.1.7. How to Check that a Logic is Adequate

4.2. Calculation of Natural Deduction from Statements
- 4.2.1. Formal Language
- 4.2.2. Deductive Mechanism

4.3. Formalization and Deduction Strategies for Propositional Logic
- 4.3.1. Formalization Strategies
- 4.3.2. Natural Reasoning
- 4.3.3. Laws and Rules
- 4.3.4. Axiomatic Deduction and Natural Deduction
- 4.3.5. Calculating Natural Deduction
- 4.3.6. Primitive Rules of Propositional Calculus

4.4. Semantics of Propositional Logic
- 4.4.1. Truth Tables
- 4.4.2. Equivalence
- 4.4.3. Tautologies and Contradictions
- 4.4.4. Validation of Propositional Sentences
- 4.4.5. Validation by Means of Truth Tables
- 4.4.6. Validation Using Semantic Trees
- 4.4.7. Validation by Refutation

4.5. Applications of Propositional Logic: Logic Circuits
- 4.5.1. Basic Gates
- 4.5.2. Circuits
- 4.5.3. Mathematical Models of the Circuits
- 4.5.4. Minimization
- 4.5.5. The Second Canonical Form and the Minimum Form in Product of Additions
- 4.5.6. Other Gates

4.6. Natural Predicate Deduction Calculus
- 4.6.1. Formal Language
- 4.6.2. Deductive Mechanism

4.7. Formalization Strategies for Predicate Logic
- 4.7.1. Introduction to Formalization in Predicate Logic
- 4.7.2. Formalization Strategies with Quantifiers

4.8. Deduction Strategies for Predicate Logic
- 4.8.1. Reason for Omission
- 4.8.2. Presentation of the New Rules
- 4.8.3. Predicate Logic as a Natural Deduction Calculus

4.9. Applications of Predicate Logic: Introduction to Logic Programming
- 4.9.1. Informal Presentation
- 4.9.2. Prolog Elements
- 4.9.3. Re-Evaluation and Cut-Off

4.10. Set Theory, Predicate Logic and Its Semantics
- 4.10.1. Intuitive Set Theory
- 4.10.2. Introduction to Predicate Semantics

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 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

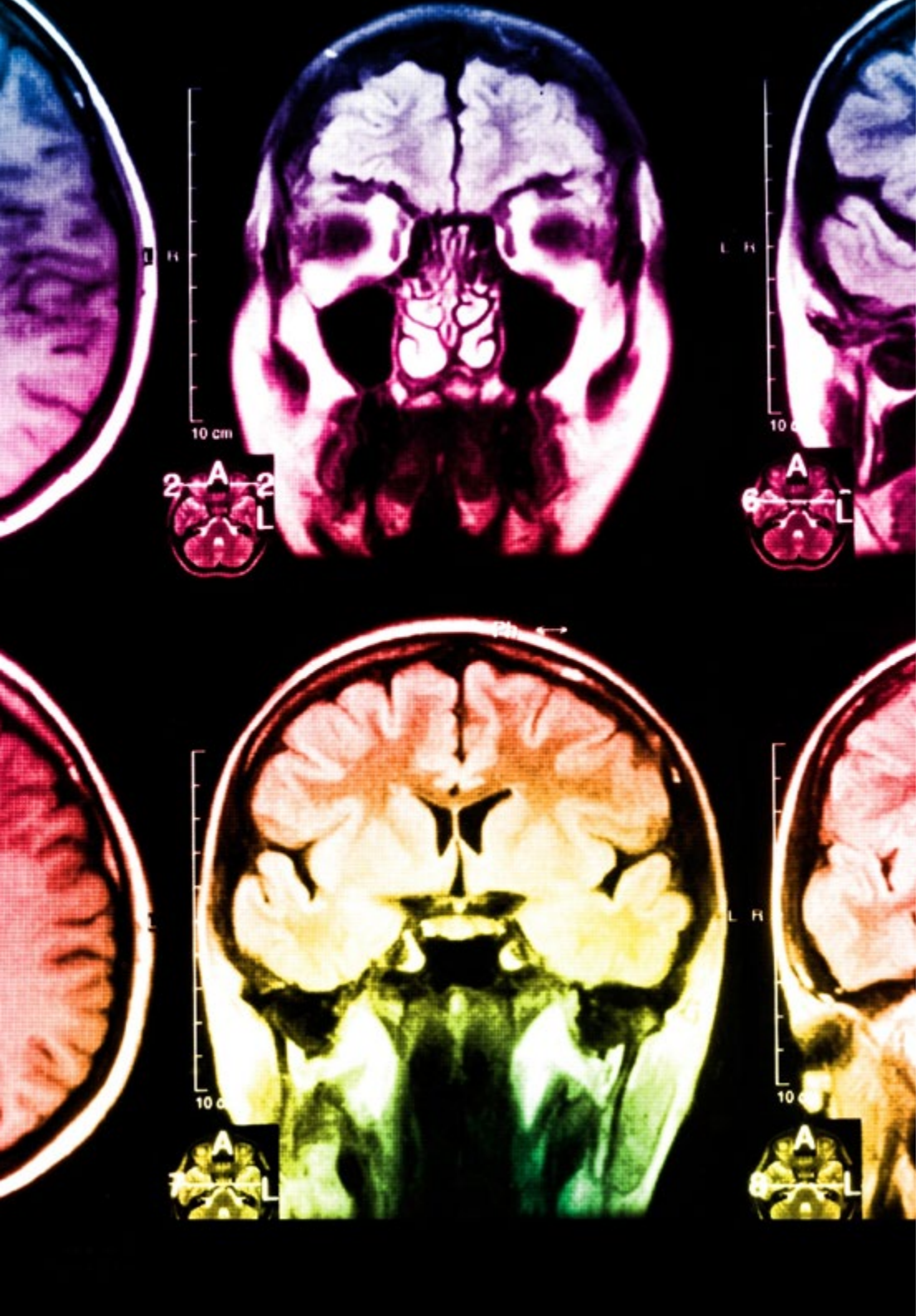
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines different teaching elements in each lesson.

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.

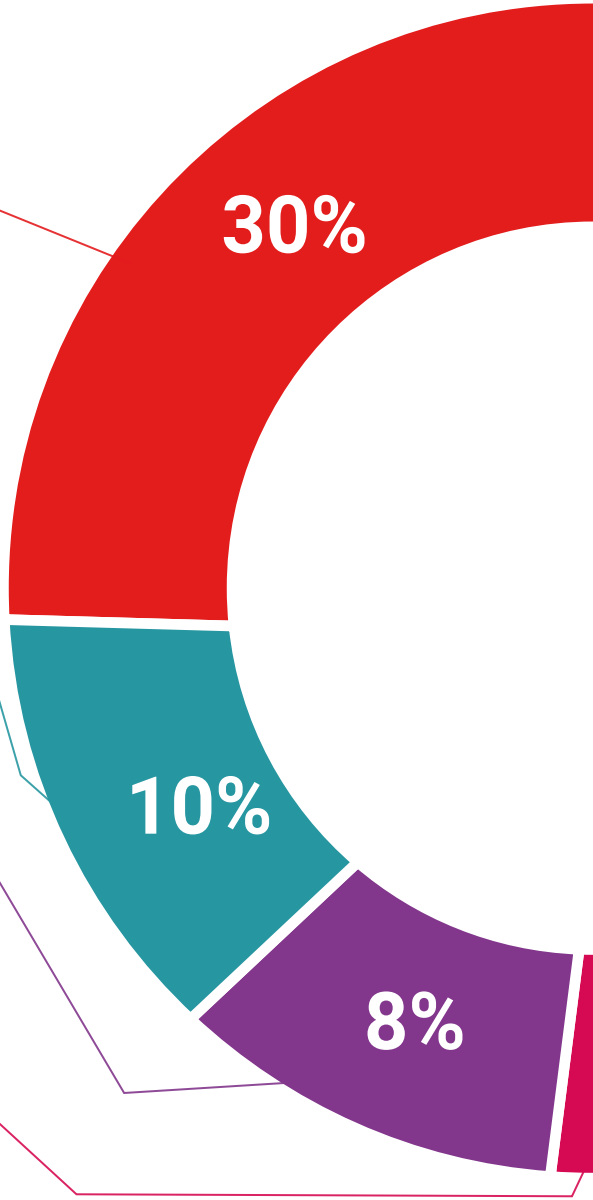
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

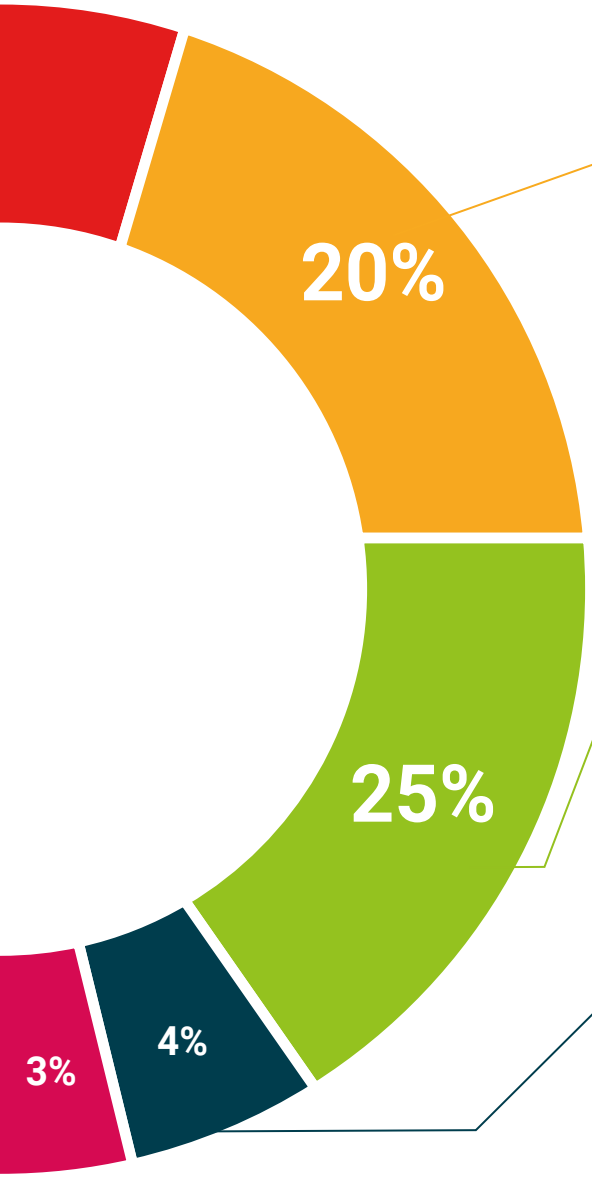
Practising Skills and Abilities

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.

05

Certificate

The Postgraduate Diploma in Mathematics and Logic for Computer Science guarantees, in addition to the most rigorous and updated training, access to a Diploma issued by TECH Global University.

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

This program will allow you to obtain your **Postgraduate Diploma in Mathematics and Logic for Computer Science** endorsed by **TECH Global University**, the world's largest online university.

TECH Global University is an official European University publicly recognized by the Government of Andorra (***official bulletin***). Andorra is part of the European Higher Education Area (EHEA) since 2003. The EHEA is an initiative promoted by the European Union that aims to organize the international training framework and harmonize the higher education systems of the member countries of this space. The project promotes common values, the implementation of collaborative tools and strengthening its quality assurance mechanisms to enhance collaboration and mobility among students, researchers and academics.

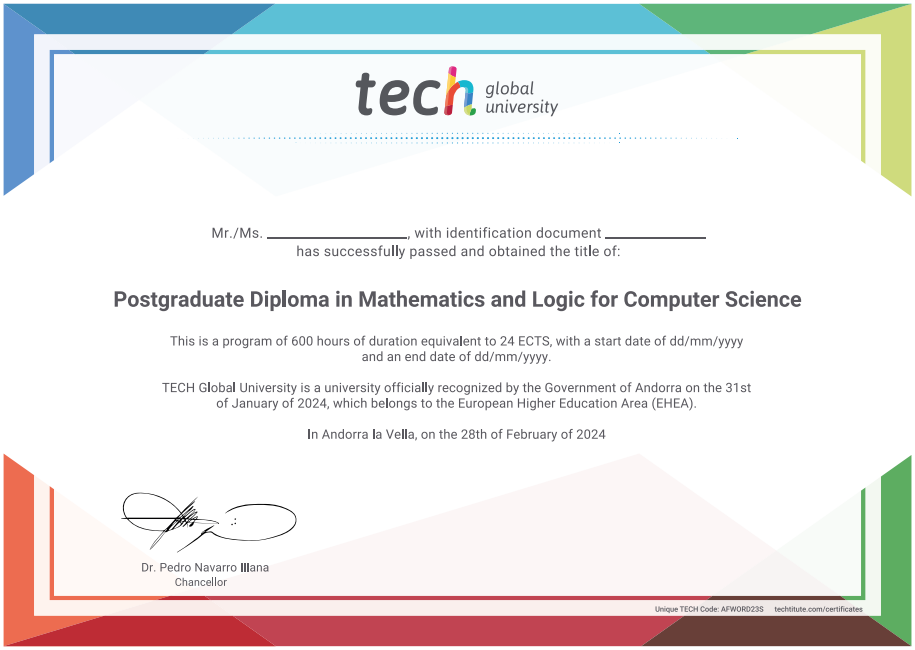
This **TECH Global University** title is a European program of continuing education and professional updating that guarantees the acquisition of competencies in its area of knowledge, providing a high curricular value to the student who completes the program.

Title: **Postgraduate Diploma in Mathematics and Logic for Computer Science**

Modality: **online**

Duration: **6 months**

Accreditation: **24 ECTS**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Mr./Ms. _____, with identification document _____
has successfully passed and obtained the title of:

Postgraduate Diploma in Mathematics and Logic for Computer Science

This is a program of 600 hours of duration equivalent to 24 ECTS, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

TECH Global University is a university officially recognized by the Government of Andorra on the 31st of January of 2024, which belongs to the European Higher Education Area (EHEA).

In Andorra la Vella, on the 28th of February of 2024

Dr. Pedro Navarro Illana
Chancellor

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 Global University will make the necessary arrangements to obtain it, at an additional cost.

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