Professional Master's Degree

Computing and Programming Languages

tech technological university

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Professional Master's Degree
Computing and Programming Languages

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

Website: www.techtitute.com/in/information-technology/professional-master-degree/master-computing-programming-languages

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01

Introduction

The IT professional needs to keep their skills fully up to date to be able to continue working in their field of competence in the most effective way, without missing out on any of the advances that are being incorporated into this field at a dizzying rate. This update is designed to provide students with complete and in-depth knowledge of the essential knowledge and the most interesting innovations in the design of algorithms for the development of computing projects, using the most innovative and efficient methods in the sector.

Acquire the fundamental know-how on Computing and Programming Languages and how to apply it successfully in the development of IT projects, in a highly competitive Professional Master's Degree"

This Professional Master's Degree focuses on the fundamentals of programming and data structure, algorithms and complexity, as well as advanced algorithm design, advanced programming, language processors and computer graphics, among other topics related to this area of computer science.

This Professional Master's Degree provides students with specific tools and skills to successfully develop their professional career in the broad environment of Computing and Programming Languages. It works on key competencies such as knowledge of the day-to-day reality and work in different IT areas and develops responsibility for the monitoring and supervision of work, as well as specific skills within this field.

Additionally, as it is a 100% online Professional Master's Degree students are not constrained by fixed timetables or the need to commute to another physical location, rather, they can access the contents at any time of the day, balancing their professional or personal life with their studies.

The teaching team of this Professional Master's Degree in Computing and Programming Languages has carefully selected each of the topics of this course to offer the student a study opportunity as complete as possible and always linked to current events.

This **Professional Master's Degree in Computing and Programming Languages** contains the most complete and up-to-date program on the market. The most important features include:

- Case studies presented by experts in Computing and Language
- The graphic, schematic, and practical contents which they contain, provide scientific and practical information on the disciplines that are essential for professional practice
- Practical exercises where a self-assessment process can be undertaken to improve learning
- Special emphasis on innovative methodologies in Computing and Language
- 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

An exceptional opportunity to learn, in a comfortable and straightforward way, the mathematical knowledge and processes necessary to carry out excellent computer programming"

A Professional Master's Degree that owes its effectiveness to the most valued educational technology in the market, with audiovisual and study systems that will allow you to learn in a faster and more comfortable way"

We place at your disposal extensive and clear didactic materials, which incorporate all the current topics of interest for the professional who wants to advance in Computing and Programming Languages.

A program of high educational impact that will allow you to tailor the workload to your needs, combining flexibility and intensity.

Its multimedia content, developed with the latest educational technology, will allow the professional a situated and contextual academic experience, that is to say, a simulated environment that will provide an immersive refresher designed to prepare the student for real situations.

This program is designed around Problem-Based Learning, whereby the professional must try to resolve the different professional practice situations that arise during the academic year. For this, the professional will have the help of an innovative, interactive video system made by recognized and experienced experts in Computing and Programming Languages.

02

Objectives

The Professional Master's Degree in Computing and Programming Languages has been created specifically for the professional who seeks to advance in this area quickly and effectively, and is organized on the basis of realistic and high-value objectives that will propel him or her to another level of performance in this field.

Our goal is to provide professionals in the IT field with a high-quality refresher that will allow them to operate with confidence in Computing and Programming Languages"

General Objective

- Provide scientific and technological development, as well as preparation for professional practice in Computing and Programming Languages, all with a cross-disciplinary and versatile course in line with new technologies and innovations in this field

Make the most of this opportunity and take the next step to get up to date on the latest developments in Computing and Language"

Specific Objectives

Module 1. Programming Fundamentals

- Understand the basic structure of a computer, software and general-purpose programming languages
- Learn to design and interpret algorithms, which are the necessary basis for software development
- Understand the essential elements of a computer program, such as the different data types, operators, expressions, statements, I/O and control statements
- Understand the different data structures available in general purpose programming languages, both static and dynamic, as well as acquiring essential knowledge for file handling
- Know the different software testing techniques and the importance of proper documentation together with good source code
- Learn the basics of the C++ programming language, one of the most widely used programming languages in the world

Module 2. Data Structure

- Learn the basics of programming in the C++ language, including classes, variables, conditional expressions, and objects
- Understand abstract data types, linear data structure types, simple and complex hierarchical data structures, and their implementation in C++
- Understand the operation of advanced data structures that differ from the norm
- Know about the theory and practice related to the use of priority heaps and queues
- Learn how hash tables work as abstract data types and functions
- Understand graph theory, as well as algorithms and advanced graph concepts

Module 3. Algorithm and Complexity

- Learn the main strategies for algorithm design, as well as the different methods and measures for algorithm computation
- Know the main sorting algorithms used in software development
- Understand the operation of different algorithms with trees, Heaps and Graphs
- Understand the operation of Greedy algorithms, their objective and examples of their use for common problems
- Also learn about the use of Greedy algorithms on graphs
- Learn the main strategic concepts of minimum path finding, with an approach to common problems in the field and algorithms for their resolution
- Understand the Backtracking technique and its main uses, as well as other alternative techniques

Module 4. Advanced Algorithm Design

- Deepen your knowledge of advanced algorithm design, analyzing recursive and divide and conquer algorithms, as well as performing amortized analysis
- Understand dynamic programming concepts and algorithms for NP problems
- Understand the operation of combinatorial optimization, as well as the different randomization algorithms and parallel algorithms
- Know and understand the operation of the different local search methods with candidate solutions
- Learn the mechanisms of formal program verification and iterative program verification, including first-order logic and Hoare's formal system
- Learn about the operation of some of the main numerical methods such as the bisection method, the Newton Raphson method and the secant method

Module 5. Advanced Programming

- Build knowledge of programming, especially as it relates to object-oriented programming, and the different types of relationships between existing classes
- Understand the different design patterns for object-oriented problems
- Learning about event-driven programming and user interface development with Qt
- Acquire essential knowledge of concurrent programming, processes and threads
- Learn how to manage the use of threads and synchronization, as well as the resolution of common problems in concurrent programming
- Understand the importance of documentation and testing in software development

Module 6. Theoretical Computing

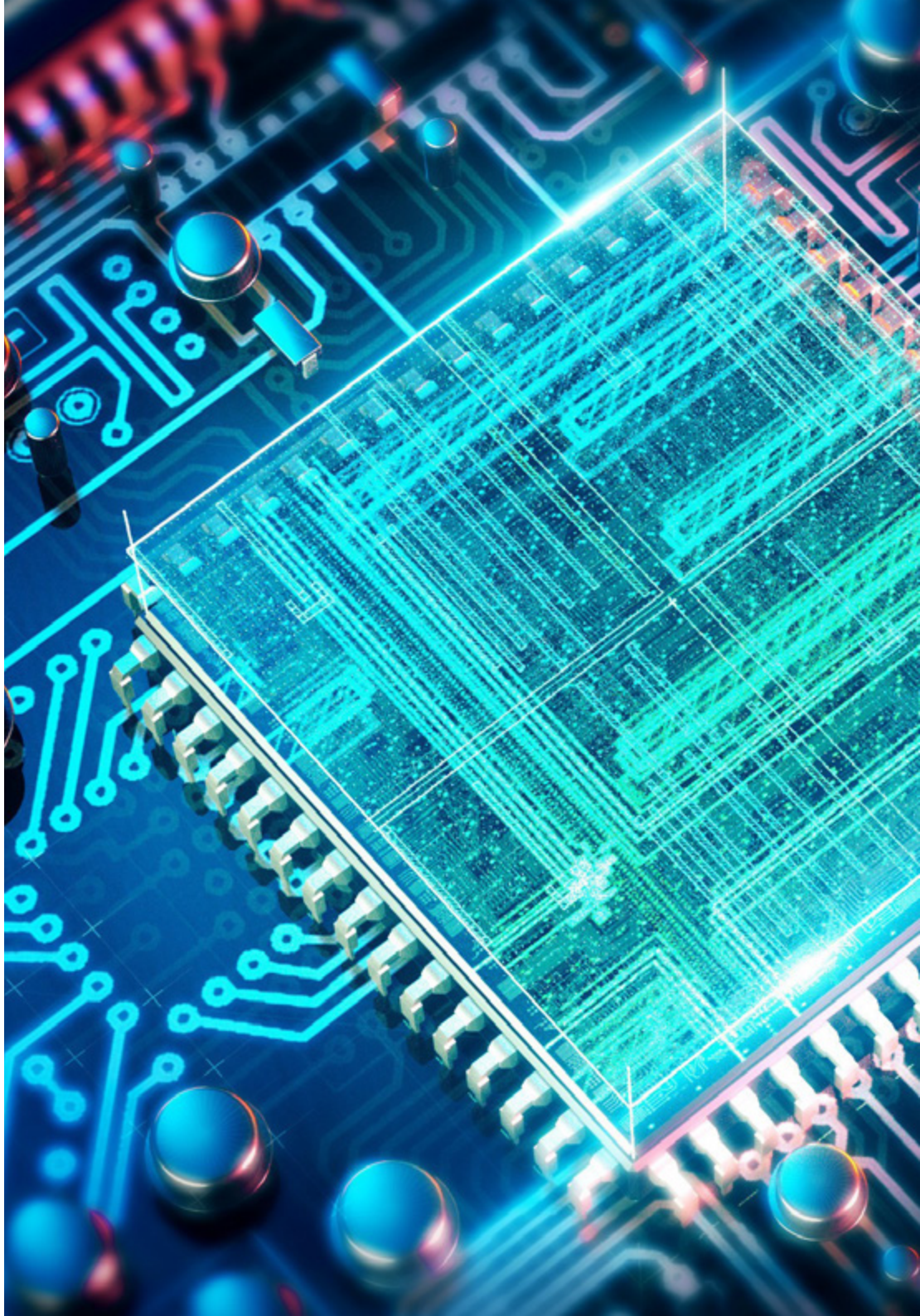
- Understand the essential theoretical mathematical concepts behind computer science, such as propositional logic, set theory, and numerable and non-numerable sets
- Understand the concepts of formal languages and grammars, as well as Turing machines in their different versions
- Learn about the different types of intractable problems, including the different versions of these problems and their approaches
- Understand the operation of different kinds of randomization-based languages and other classes and grammars
- Learn about other advanced computing systems such as Membrane Computing, DNA Computing and Quantum Computing

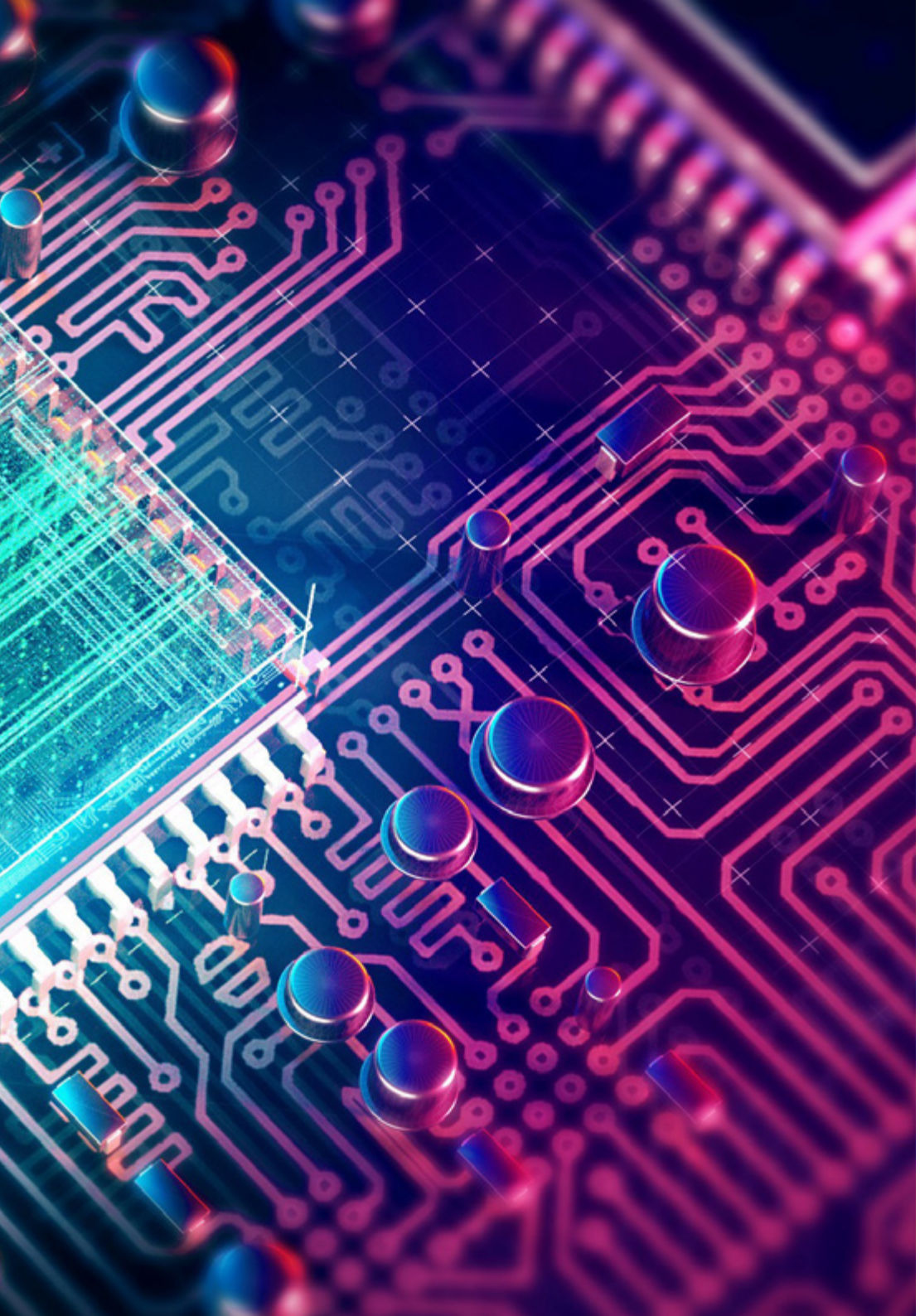
Module 7. Automata Theory and Formal Languages

- Understand the theory of automata and formal languages, learning the concepts of alphabets, strings and languages, as well as how to perform formal demonstrations
- Delve into the different types of finite automata, whether deterministic or non-deterministic
- Learn the basic and advanced concepts related to regular languages and regular expressions, as well as the application of pumping lemma and the clauses of regular languages
- Understand context-independent grammars and the operation of stack automata
- Gain knowledge on normal forms, the pumping lemma of context-independent grammars and properties of context-independent languages

Module 8. Language Processors

- Introduce the concepts related to the compilation process and the different types of analysis: lexical, syntactic and semantic
- Know how a lexical analyzer works, its implementation and error recovery
- Deepen knowledge of syntactic analysis, both top-down and bottom-up, but with special emphasis on the different types of bottom-up syntactic parsers
- Understand the operation of semantic parsers, syntax-driven tradition, the symbol table and the various types
- Learn the different mechanisms for code generation, both in execution environments and for intermediate code generation
- Lay the groundwork for code optimization, including expression reordering and loop optimization





Module 9. Computer Graphics and Visualization

- Introduce the essential concepts of computer graphics and computer visualization, such as color theory and its models and the properties of light
- Understand the operation of the output primitives and their algorithms, both for line drawing and for drawing circles and fills
- Conduct an in-depth study of the different transformations, both 2D and 3D, and their coordinate systems and computer visualization
- Learn how to make 3D projections and cuts, as well as how to remove hidden surfaces
- Learn the theory related to interpolation and parametric curves, as well as Bézier Curves and B-splines

Module 10. Bio-inspired Computing

- Introduce the concept of bio-inspired computing, as well as understanding how different types of social adaptation algorithms and genetic algorithms work
- Conduct an in-depth study of the different models of evolutionary computing, including its strategies, programming, algorithms and models based on distribution estimation
- Understand the main space exploration-exploitation strategies for genetic algorithms
- Understand the operation of evolutionary programming applied to learning problems and multi-objective problems
- Learn the essential concepts related to neural networks and understand the operation of real-life cases applied to areas as diverse as medical research, economics and computer vision

03

Skills

After passing the assessments of the Professional Master's Degree in Computing and Programming Languages, the professional will have acquired the necessary skills and know the fundamental principles of computing with the ability to work with programming languages and data.

Gain the ability to carry out new computer developments based on the understanding and control of the different languages and algorithms and their practical application"

General Skills

- Successfully perform the tasks related to Computing and Programming Languages

Improve your skills to work on various technological projects"

Specific Skills

- Design algorithms to develop computer programs and apply programming language
- Understand and use IT data structure
- Use the necessary algorithms to solve computer problems
- Gain in-depth knowledge of advanced algorithm design and search methods
- Carry out computer programming tasks
- Understand and apply the theory behind computer science, such as mathematics
- Know automata theory and how to apply computing language
- Know the theoretical foundations of programming languages and the associated lexical, syntactic and semantic processing techniques
- Understand the basic concepts of mathematics and computational complexity in order to apply them to the resolution of IT problems
- Know and apply the fundamental principles of computer science to carry out new computer developments

04

Structure and Content

The structure of the contents has been created in such a way that the knowledge is assimilated in a progressive way, achieving a growth trajectory that will lead you to excellence in your profession.

All the areas of interest that you need to master in order to work confidently and successfully in Computing and Programming Languages, gathered together in a top-quality syllabus"

Module 1. Programming Fundamentals

1.1. Introduction to Programming
- 1.1.1. Basic Computer Structure
- 1.1.2. Software
- 1.1.3. Programming Languages
- 1.1.4. Computer Application Life Cycle

1.2. Algorithm Design
- 1.2.1. Problem Solving
- 1.2.2. Descriptive Techniques
- 1.2.3. Algorithm Elements and Structure

1.3. Program Elements
- 1.3.1. C++ Origin and Features
- 1.3.2. Development Environment
- 1.3.3. Concept of Program
- 1.3.4. Types of Fundamental Data
- 1.3.5. Operators
- 1.3.6. Expressions
- 1.3.7. Statements
- 1.3.8. Data Input and Output

1. 4. Control Statements
- 1.4.1. Statements
- 1.4.2. Branches
- 1.4.3. Loops

1.5. Abstraction and Modularity: Functions
- 1.5.1. Modular Design
- 1.5.2. Concept of Function and Utility
- 1.5.3. Definition of a Function
- 1.5.4. Execution Flow in the Call of a Function
- 1.5.5. Function Prototypes
- 1.5.6. Results Return
- 1.5.7. Calling Functions: Parameters
- 1.5.8. Parameter Passing According to Reference and Value
- 1.5.9. Scope Identifier

1.6. Statistical Data Structures
- 1.6.1. Arrays
- 1.6.2. Matrices Polyhedra
- 1.6.3. Searching and Sorting
- 1.6.4. Chaining: I/O Functions for Chains
- 1.6.5. Structures: Unions
- 1.6.6. New Types of Data

1.7. Dynamic Data Structures: Pointers
- 1.7.1. Concept. Definition of Pointer
- 1.7.2. Pointer Operators and Operations
- 1.7.3. Pointer Arrays
- 1.7.4. Pointers and Arrays
- 1.7.5. Chain Pointers
- 1.7.6. Structure Pointers
- 1.7.7. Multiple Indirection
- 1.7.8. Function Pointers
- 1.7.9. Function, Structure and Array Passing as Function Parameters

1.8. Files
- 1.8.1. Basic Concepts
- 1.8.2. File Operations
- 1.8.3. Types of Files
- 1.8.4. File Organization
- 1.8.5. Introduction to C++ Files
- 1.8.6. Managing Files

1.9. Recursion
- 1.9.1. Definition of Recursion
- 1.9.2. Types of Recursion
- 1.9.3. Advantages and Disadvantages
- 1.9.4. Considerations
- 1.9.5. Recursive-Iterative Conversion
- 1.9.6. Recursion Stack

1.10. Testing and Documentation
- 1.10.1. Program Testing
- 1.10.2. White Box Testing
- 1.10.3. Black Box Testing
- 1.10.4. Testing Tools
- 1.10.5. Program Documentation

Module 2. Data Structure

2.1. Introduction to C++ Programming
- 2.1.1. Classes, Constructors, Methods and Attributes
- 2.1.2. Variables:
- 2.1.3. Conditional Expressions and Loops
- 2.1.4. Objects

2.2. Abstract Data Types (ADT)
- 2.2.1. Types of Data
- 2.2.2. Basic Structures and ADTs
- 2.2.3. Vectors and Arrays

2.3. Lineal Data Structures
- 2.3.1. ADT List Definition
- 2.3.2. Linked and Doubly Linked Lists
- 2.3.3. Ordered Lists
- 2.3.4. Lists in C++
- 2.3.5. ADT Stack
- 2.3.6. ADT Queue
- 2.3.7. Stack and Queue in C++

2.4. Hierarchical Data Structures
- 2.4.1. ADT Tree
- 2.4.2. Routes
- 2.4.3. N-ary Trees
- 2.4.4. Binary Trees
- 2.4.5. Binary Search Trees

2.5. Hierarchical Data Structures: Complex Trees
- 2.5.1. Perfectly Balanced Trees or Minimum Height Trees
- 2.5.2. Multi-path Trees
- 2.5.3. Bibliographical References

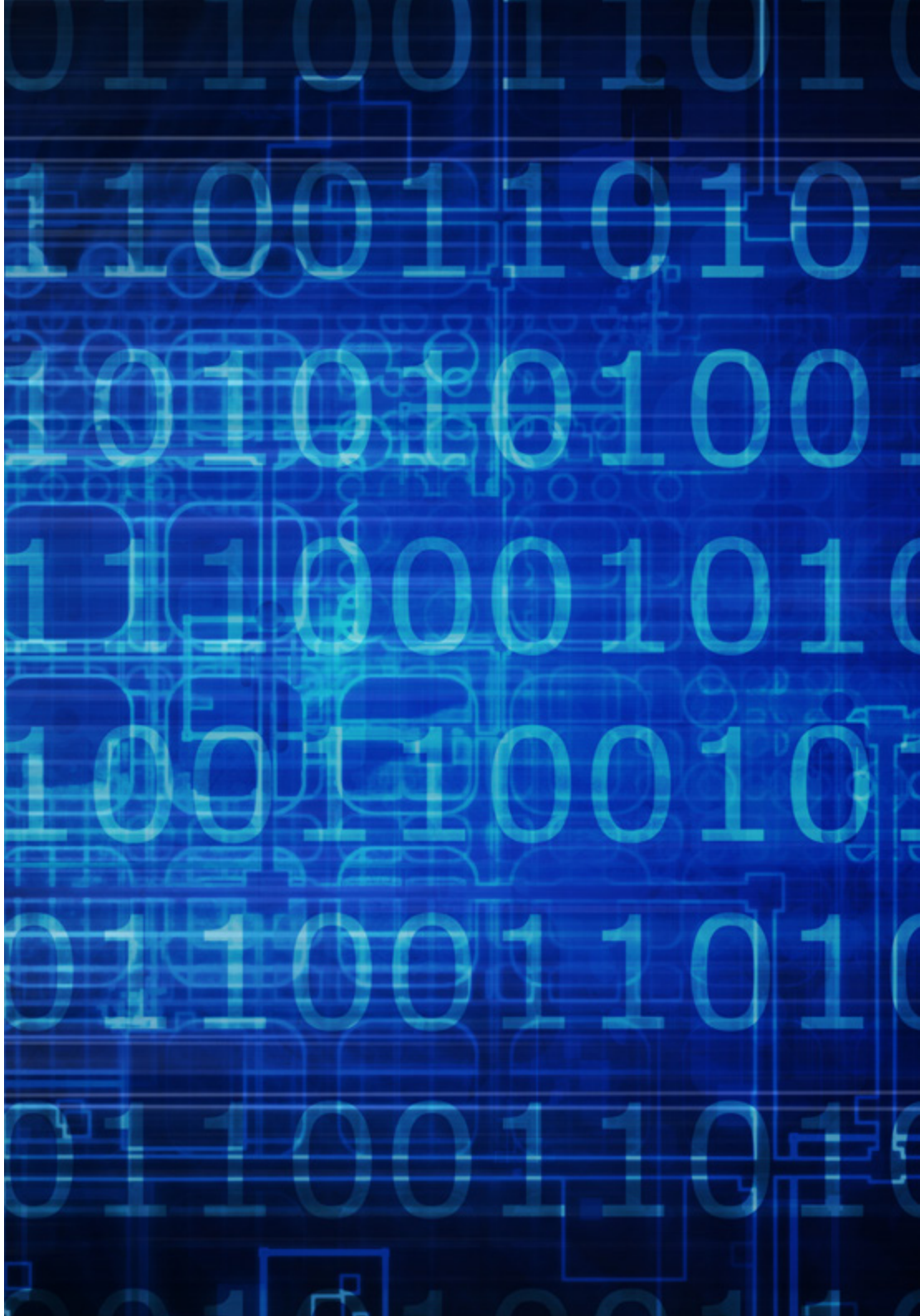
2.6. Priority Heaps and Queues
- 2.6.1. ADT Heaps
- 2.6.2. ADT Priority Queues

2.7. Hash Tables
- 2.7.1. ADT Hash Table
- 2.7.2. Hash Functions
- 2.7.3. Hash Function in Hash Tables
- 2.7.4. Redistribution
- 2.7.5. Open Hash Tables

2.8. Graphs
- 2.8.1. ADT Graph
- 2.8.2. Types of Graph
- 2.8.3. Graphical Representation and Basic Operations
- 2.8.4. Graph Design

2.9. Algorithms and Advanced Concepts on Graphs
- 2.9.1. Problems with Graphs
- 2.9.2. Path Algorithms
- 2.9.3. Search or Path Algorithms
- 2.9.4. Other Algorithms

2.10. Other Data Structures
- 2.10.1. Sets
- 2.10.2. Parallel Arrays
- 2.10.3. Table of Symbols
- 2.10.4. Tries



Module 3. Algorithm and Complexity

3.1. Introduction to Algorithm Design Strategies
- 3.1.1. Recursion
- 3.1.2. Divide and Conquer
- 3.1.3. Other Strategies

3.2. Algorithm Efficiency and Analysis
- 3.2.1. Efficiency Measures
- 3.2.2. Measuring Entry Size
- 3.2.3. Measuring Execution Time
- 3.2.4. Worst, Best and Average Case
- 3.2.5. Asymptotic Notation
- 3.2.6. Mathematical Analysis Criteria for Non-Recursive Algorithms
- 3.2.7. Mathematical Analysis for Recursive Algorithms
- 3.2.8. Empirical Analysis for Algorithms

3.3. Sorting Algorithms
- 3.3.1. Concept of Sorting
- 3.3.2. Bubble Sorting
- 3.3.3. Selection Sorting
- 3.3.4. Insertion Sorting
- 3.3.5. Merge Sorting
- 3.3.6. Quick Sorting

3.4. Tree Algorithms
- 3.4.1. Concept of Tree
- 3.4.2. Binary Trees
- 3.4.3. Tree Paths
- 3.4.4. Representing Expressions
- 3.4.5. Sorted Binary Trees
- 3.4.6. Balanced Binary Trees

3.5. Algorithms Using Heaps
- 3.5.1. Heaps
- 3.5.2. The HeapSort Algorithm
- 3.5.3. Priority Queues

3.6. Graph Algorithms
- 3.6.1. Representation
- 3.6.2. Width Traversal
- 3.6.3. Depth Traversal
- 3.6.4. Topological Sorting

3.7. Greedy Algorithms
- 3.7.1. Greedy Strategy
- 3.7.2. Greedy Strategy Elements
- 3.7.3. Currency Exchange
- 3.7.4. Traveling Salesman Problem
- 3.7.5. Knapsack Problem

3.8. Minimal Pathways Search
- 3.8.1. Shortest Path Problem
- 3.8.2. Cycles and Negative Arcs
- 3.8.3. Dijkstra's Algorithm

3.9. Greedy Algorithms for Graphs
- 3.9.1. Minimum Spanning Tree
- 3.9.2. Prim's Algorithm
- 3.9.3. Kruskal's Algorithm
- 3.9.4. Complexity Analysis

3.10. Backtracking
- 3.10.1. Backtracking
- 3.10.2. Alternative Techniques

Module 4. Advanced Algorithm Design

4.1. Analysis of Recursive and Divide and Conquer Algorithms
- 4.1.1. Posing and Solving Homogeneous and Non-Homogeneous Recurrence Equations
- 4.1.2. Divide and Conquer Strategy Overview

4.2. Amortized Analysis
- 4.2.1. Aggregated Analysis
- 4.2.2. The Accounting Method
- 4.2.3. The Potential Method

4.3. Dynamic Programming and Algorithms for NP Problems
- 4.3.1. Dynamic Programming Features
- 4.3.2. Backtracking
- 4.3.3. Branching and Pruning

4.4. Combinatorial Optimization
- 4.4.1. Representation of Problems
- 4.4.2. Optimization in 1D

4.5. Randomization Algorithms
- 4.5.1. Examples of Randomization Algorithms
- 4.5.2. The Buffon Theorem
- 4.5.3. The Monte Carlo Algorithm
- 4.5.4. The Las Vegas Algorithm

4.6. Local Search and with Candidates
- 4.6.1. Garcient Ascent
- 4.6.2. Hill Climbing
- 4.6.3. Simulated Annealing
- 4.6.4. Tabu Search
- 4.6.5. Search with Candidates

4.7. Formal Program Verification
- 4.7.1. Specification of Functional Abstractions
- 4.7.2. The Language of First Order Logic
- 4.7.3. Hoare's Formal System

4.8. Iterative Program Verification
- 4.8.1. Rules of Hoare's Formal System
- 4.8.2. Concept of Invariant Iterations

4.9. Numeric Methods
- 4.9.1. The Bisection Method
- 4.9.2. The Newton Raphson Method
- 4.9.3. The Secant Method

4.10. Parallel Algorithms
- 4.10.1. Parallel Binary Operations
- 4.10.2. Parallel Operations with Graphs
- 4.10.3. Parallelism in Divide and Conquer
- 4.10.4. Parallelism in Dynamic Programming

Module 5. Advanced Programming

5.1. Introduction to Object Oriented Programming
- 5.1.1. Introduction to Object Oriented Programming
- 5.1.2. Class Design
- 5.1.3. Introduction to Unified Modeling Language (UML) for Problem Modeling

5.2. Class Relations
- 5.2.1. Abstractions and Heritage
- 5.2.2. Advanced Concepts of Heritage
- 5.2.3. Polymorphism
- 5.2.4. Composition and Aggregation

5.3. Introduction to Design Patterns for Object Oriented problems
- 5.3.1. What Are Design Patterns?
- 5.3.2. Factory Pattern
- 5.3.3. Singleton Pattern
- 5.3.4. Observer Pattern
- 5.3.5. Composite Pattern

5.4. Exceptions
- 5.4.1. What Are the Exceptions?
- 5.4.2. Catching and Handling Exceptions
- 5.4.3. Launching Exceptions
- 5.4.4. Creation Exceptions

5.5. User Interface
- 5.5.1. Introduction to Qt
- 5.5.2. Positioning
- 5.5.3. What Are Events?
- 5.5.4. Events: Definition and Capture
- 5.5.5. User Interface Development

5.6. Introduction to Concurrent Programming
- 5.6.1. Introduction to Concurrent Programming
- 5.6.2. Concept of Process and Thread
- 5.6.3. Process and Thread Interaction
- 5.6.4. C++ Threads
- 5.6.5. Advantages and Disadvantages of Concurrent Programming

5.7. Thread Management and Synchronization
- 5.7.1. Thread Life Cycle
- 5.7.2. Thread Class
- 5.7.3. Thread Planning
- 5.7.4. Thread Groups
- 5.7.5. Daemon Threads
- 5.7.6. Synchronization
- 5.7.7. Locking Mechanisms
- 5.7.8. Communication Mechanisms
- 5.7.9. Monitors

5.8. Common Problems in Concurrent Programming
- 5.8.1. Producer-Consumer Problem
- 5.8.2. Readers-Writers Problem
- 5.8.3. Dining Philosophers Problem

5.9. Software Testing and Documentation
- 5.9.1. Why Is It Important to Document Software?
- 5.9.2. Design Documentation
- 5.9.3. Documentation Tool Use

5.10. Software Tests
- 5.10.1. Introduction to Software Tests
- 5.10.2. Types of Tests
- 5.10.3. Unit Test
- 5.10.4. Integration Tests
- 5.10.5. Validation Test
- 5.10.6. System Tests

Module 6. Theoretical Computing

6.1. Mathematical Concepts Used
- 6.1.1. Introduction to Propositional Logic
- 6.1.2. Relationship Theory
- 6.1.3. Numerable and Non-Numerable Sets

6.2. Formal Languages and Grammar and Introduction to Turing Machines
- 6.2.1. Formal Languages and Grammar
- 6.2.2. Decision Problem
- 6.2.3. The Turing Machine

6.3. Extensions for Turing Machines, Constrained Turing Machines and Computers
- 6.3.1. Programming Techniques for Turing Machines
- 6.3.2. Programming Techniques for Turing Machines
- 6.3.3. Restricted Turing Machines
- 6.3.4. Turing Machines and Computers

6.4. Undecidable Problems
- 6.4.1. Non-Recursively Enumerable Language
- 6.4.2. An Undecidable Recursively Enumerable Problem

6.5. Other Undecidable Problems
- 6.5.1. Programming Techniques for Turing Machines
- 6.5.2. Post Correspondence Problem (PCP)

6.6. Intractable Problems
- 6.6.1. P and NP Classes
- 6.6.2. A Complete NP Problem
- 6.6.3. Restricted Satisfiability Problem
- 6.6.4. Other Complete NP Problems

6.7. Co-NP and PS Problems
- 6.7.1. Complements to NP languages
- 6.7.2. Solvable Problems in Polynomial Space
- 6.7.3. Complete PS Problems

6.8. Classes of Randomization-Based Languages
- 6.8.1. MT Model with Randomization
- 6.8.2. RP and ZPP Classes
- 6.8.3. Primality Test
- 6.8.4. Complexity of the Primality Test

6.9. Other Classes and Grammars
- 6.9.1. Probabilistic Finite Automata
- 6.9.2. Cellular Automata
- 6.9.3. McCullogh and Pitts Cells
- 6.9.4. Lindenmayer Grammar

6.10. Advanced Computing Systems
- 6.10.1. Membrane Computing: Systems
- 6.10.2. Computing with DNA
- 6.10.3. Quantum Computing

Module 7. Automata Theory and Formal Languages

7.1. Introduction to Automata Theory
- 7.1.1. Why Study Automata Theory?
- 7.1.2. Introduction to Formal Demonstrations
- 7.1.3. Other Types of Demonstration
- 7.1.4. Mathematical Induction
- 7.1.5. Alphabets, Strings and Languages

7.2. Deterministic Finite Automata
- 7.2.1. Introduction to Finite Automata
- 7.2.2. Deterministic Finite Automata

7.3. Non-Deterministic Finite Automata
- 7.3.1. Non-Deterministic Finite Automata
- 7.3.2. Equivalency between AFD and AFN
- 7.3.3. Finite Automata with Transitions

7.4. Languages and Regular Expressions (I)
- 7.4.1. Languages and Regular Expressions
- 7.4.2. Finite Automata and Regular Expressions

7.5. Languages and Regular Expressions (II)
- 7.5.1. Conversion of Regular Expressions into Automata
- 7.5.2. Applications of Regular Expressions
- 7.5.3. Algebra of Regular Expressions

7.6. Lemma Pumping and Closure of Regular Languages
- 7.6.1. Lemma Pumping
- 7.6.2. Closure Properties of Regular Languages

7.7. Equivalence and Minimization of Automata
- 7.7.1. FA Equivalence
- 7.7.2. FA Minimization

7.8. Context Independent Grammars (CIG)
- 7.8.1. Context Independent Grammars
- 7.8.2. Derivation Trees
- 7.8.3. GIC Applications
- 7.8.4. Ambiguity in Grammars and Languages

7.9. Stack Automatons and GIC
- 7.9.1. Definition of Stack Automata
- 7.9.2. Languages Accepted by a Stack Automaton
- 7.9.3. Equivalence between Stack Automata and GICs
- 7.9.4. Deterministic Stack Automata

7.10. Normal Forms, GIC Lemma Pumping and Properties of LICs
- 7.10.1. Normal Forms of GICs
- 7.10.2. Lemma Pumping
- 7.10.3. Closure Properties of Languages
- 7.10.4. Decision Properties of LICs

Module 8. Language Processors

8.1. Introduction to the Compilation Process
- 8.1.1. Compilation and Interpretation
- 8.1.2. Compiler Execution Environment
- 8.1.3. Analysis Process
- 8.1.4. Synthesis Process

8.2. Lexical Analyzer
- 8.2.1. What is a Lexical Analyzer?
- 8.2.2. Implementation of the Lexical Analyzer
- 8.2.3. Semantic Actions
- 8.2.4. Error Recovery
- 8.2.5. Implementation Issues

8.3. Parsing
- 8.3.1. What is a Syntactic Analyzer?
- 8.3.2. Previous Concepts
- 8.3.3. Top-down Analyzers
- 8.3.4. Bottom-up Analyzers

8.4. Top-down Parsing and Bottom-up Parsing
- 8.4.1. LL Analyzer (1)
- 8.4.2. LR Analyzer (0)
- 8.4.3. Analyzer Example

8.5. Advanced Bottom-Up Parsing
- 8.5.1. SLR Analyzers
- 8.5.2. LR Analyzer (1)
- 8.5.3. LR Analyzer(K)
- 8.5.4. LALR Analyzers

8.6. Semantic Analysis (I)
- 8.6.1. Syntax-Driven Translation
- 8.6.2. Table of Symbols

8.7. Semantic Analysis (II)
- 8.7.1. Type Checking
- 8.7.2. The Type Subsystem
- 8.7.3. Type Equivalence and Conversions

8.8. Code Generation and Execution Environment
- 8.8.1. Design Aspects
- 8.8.2. Execution Environment
- 8.8.3. Memory Organization
- 8.8.4. Memory Allocation

8.9. Intermediate Code Generation
- 8.9.1. Synthesis-driven Translation
- 8.9.2. Intermediate Representations
- 8.9.3. Examples of Translations

8.10. Code Optimization
- 8.10.1. Assignment of Records
- 8.10.2. Elimination of Dead Assignments
- 8.10.3. Compile-time Execution
- 8.10.4. Reordering of Expressions
- 8.10.5. Loop Optimization

Module 9. Computer Graphics and Visualization

9.1. Color Theory
- 9.1.1. Properties of Light
- 9.1.2. Color Models
- 9.1.3. The CIE Standard
- 9.1.4. Profiling

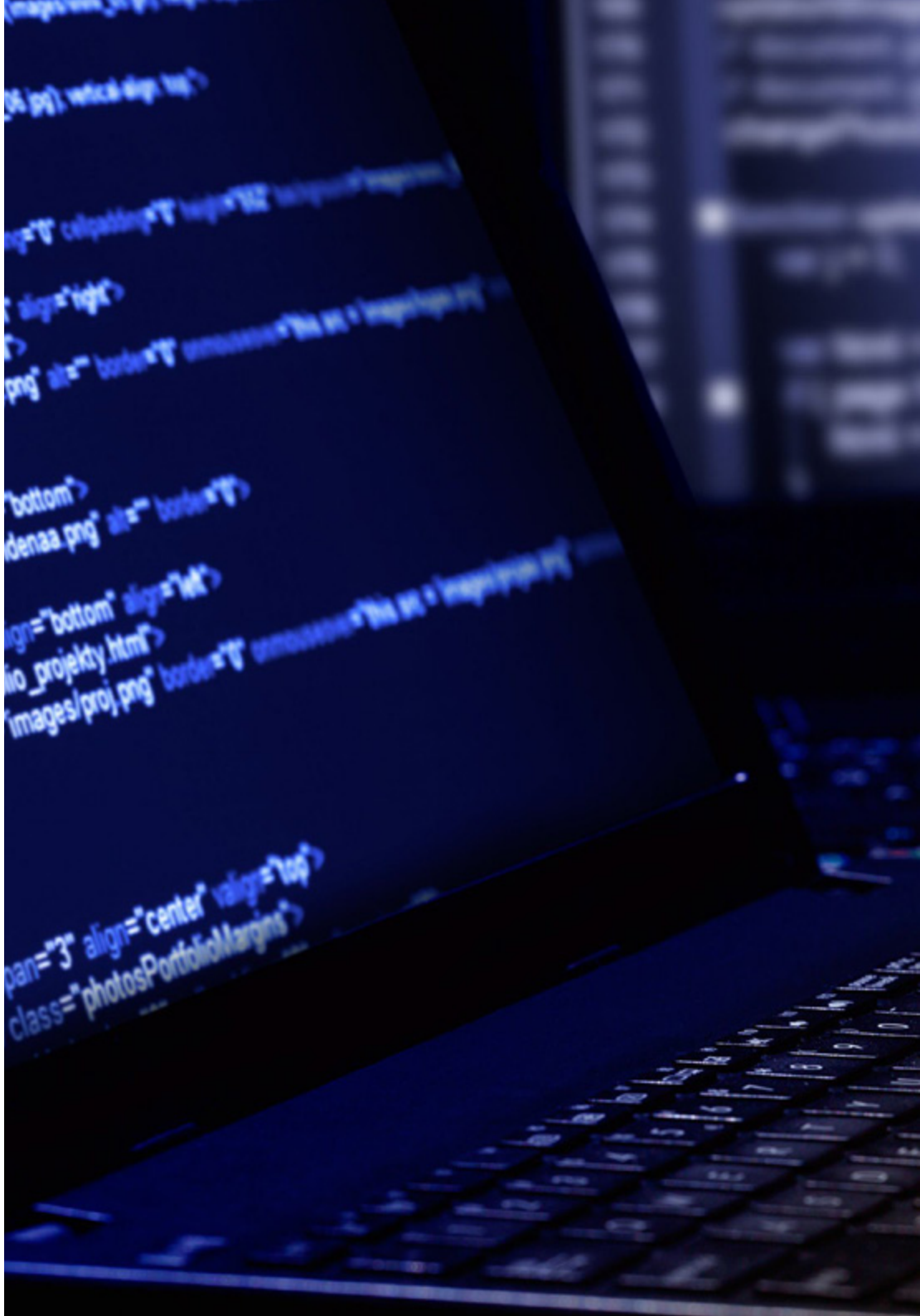
9.2. Output Primitives
- 9.2.1. The Video Controller
- 9.2.2. Line Drawing Algorithms
- 9.2.3. Circumferences Drawing Algorithms
- 9.2.4. Backfill Algorithms

9.3. 2D Transformations and 2D Coordinate Systems and 2D Clipping
- 9.3.1. Basic Geometric Transformations
- 9.3.2. Homogeneous Coordinates
- 9.3.3. Inverse Transformation
- 9.3.4. Transformation Composition
- 9.3.5. Other Transformations
- 9.3.6. Coordinate Changing
- 9.3.7. 2D Coordinate Systems
- 9.3.8. Coordinate Changing
- 9.3.9. Standardization
- 9.3.10. Clipping Algorithms

9.4. 3D Transformations
- 9.4.1. Translation
- 9.4.2. Rotation
- 9.4.3. Scaling
- 9.4.4. Reflection
- 9.4.5. Shearing

9.5. Viewing and Changing 3D Coordinates
- 9.5.1. 3D Coordinate Systems
- 9.5.2. Visualisation
- 9.5.3. Coordinate Changing
- 9.5.4. Projection and Standardization

9.6. 3D Projection and Cropping
- 9.6.1. Orthogonal Projection
- 9.6.2. Oblique Parallel Projection
- 9.6.3. Projection Perspective
- 9.6.4. 3D Clipping Algorithms



9.7. Elimination of Hidden Surfaces
- 9.7.1. Back Face Removal
- 9.7.2. Z-buffer
- 9.7.3. Painter Algorithm
- 9.7.4. Warnock Algorithm
- 9.7.5. Hidden Line Detection

9.8. Interpolation and Parametric Curves
- 9.8.1. Interpolation and Approximation with Polynomials
- 9.8.2. Parametric Representation
- 9.8.3. Lagrange's Polynomial
- 9.8.4. Natural Cubic Splines
- 9.8.5. Base Functions
- 9.8.6. Matrix Representation

9.9. Bézier Curves
- 9.9.1. Algebraic Construction
- 9.9.2. Matrix Form
- 9.9.3. Composition
- 9.9.4. Geometric Construction
- 9.9.5. Drawing Algorithm

9.10. B-Splines
- 9.10.1. The Problem of Local Control
- 9.10.2. Uniform Cubic B-Splines
- 9.10.3. Base Functions and Control Points
- 9.10.4. Derivation of the origin and Multiplicity
- 9.10.5. Matrix Representation
- 9.10.6. Non-Uniform B-Splines

Module 10. Bio-Inspired Computing

10.1. Introduction to Bio-Inspired Computing
- 10.1.1. Introduction to Bio-Inspired Computing

10.2. Social Adaptation Algorithms
- 10.2.1. Bio-inspired Computing Based on Ant Colonies
- 10.2.2. Variants of Ant Colony Algorithms
- 10.2.3. Particle Cloud Computing

10.3. Genetic Algorithms
- 10.3.1. General Structure
- 10.3.2. Implementations of the Main Operators

10.4. Space Exploration-Exploitation Strategies for Genetic Algorithms
- 10.4.1. CHC Algorithm
- 10.4.2. Multimodal Problems

10.5. Evolutionary Computing Models (I)
- 10.5.1. Evolutionary Strategies
- 10.5.2. Evolutionary Programming
- 10.5.3. Algorithms Based on Differential Evolution

10.6. Evolutionary Computing Models (II)
- 10.6.1. Evolution Models based on Estimation of Distributions (EDA)
- 10.6.2. Genetic Programming

10.7. Evolutionary Programming Applied to Learning Disabilities
- 10.7.1. Rule-Based Learning
- 10.7.2. Evolutionary Methods in Instance Selection Problems

10.8. Multi-objective Problems
- 10.8.1. Concept of Dominance
- 10.8.2. Application of Evolutionary Algorithms to Multi-objective Problems

10.9. Neural Networks (I)
- 10.9.1. Introduction to Neural Networks
- 10.9.2. Case Study with Neural Networks

10.10. Neural Networks (II)
- 10.10.1. Examples of the Use of Neural Networks in Medical Research
- 10.10.2. Examples of the Use of Neural Networks in the Economy
- 10.10.3. Examples of the Use of Neural Networks in Artificial Vision

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

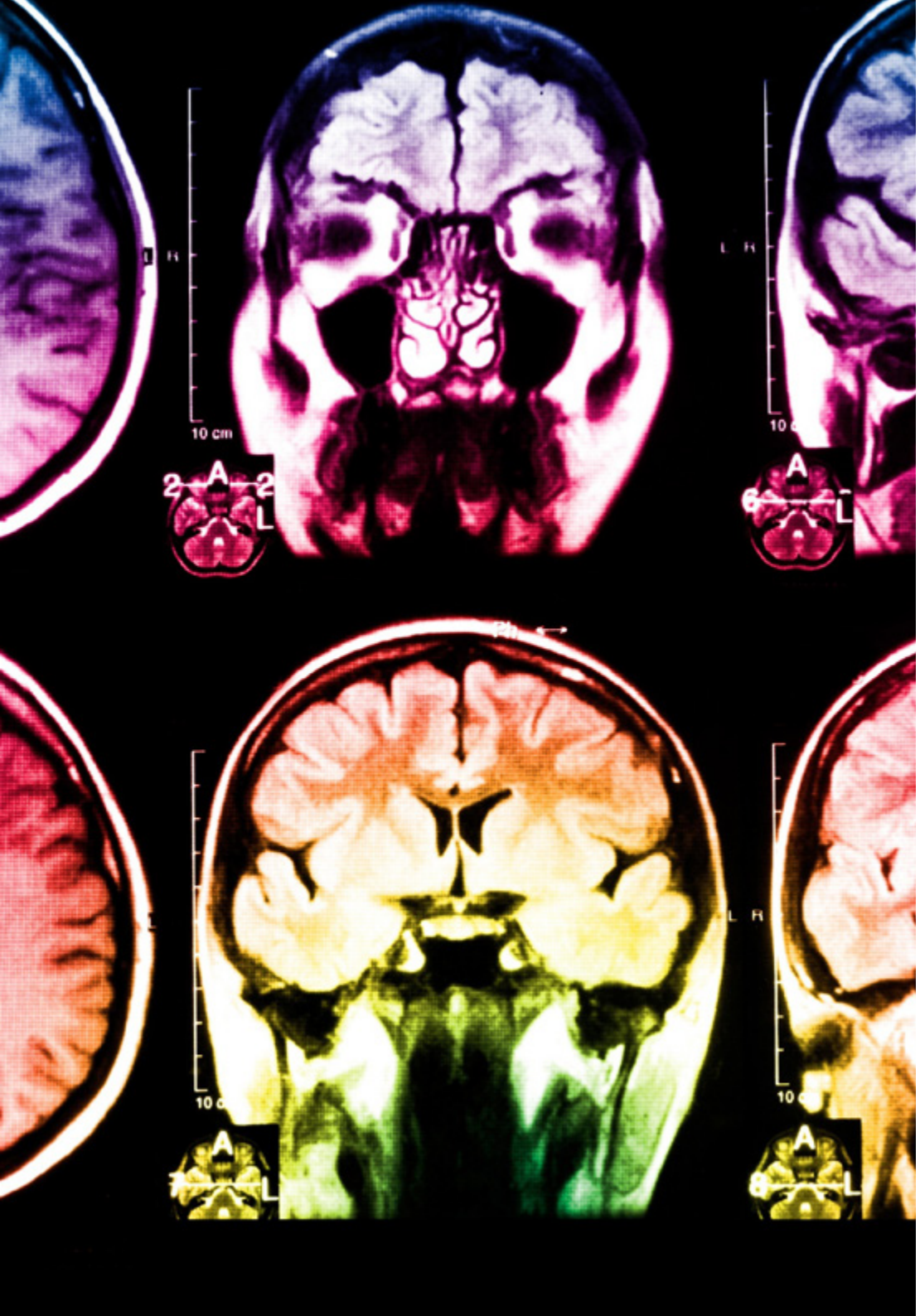
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines different teaching elements in each lesson.

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.

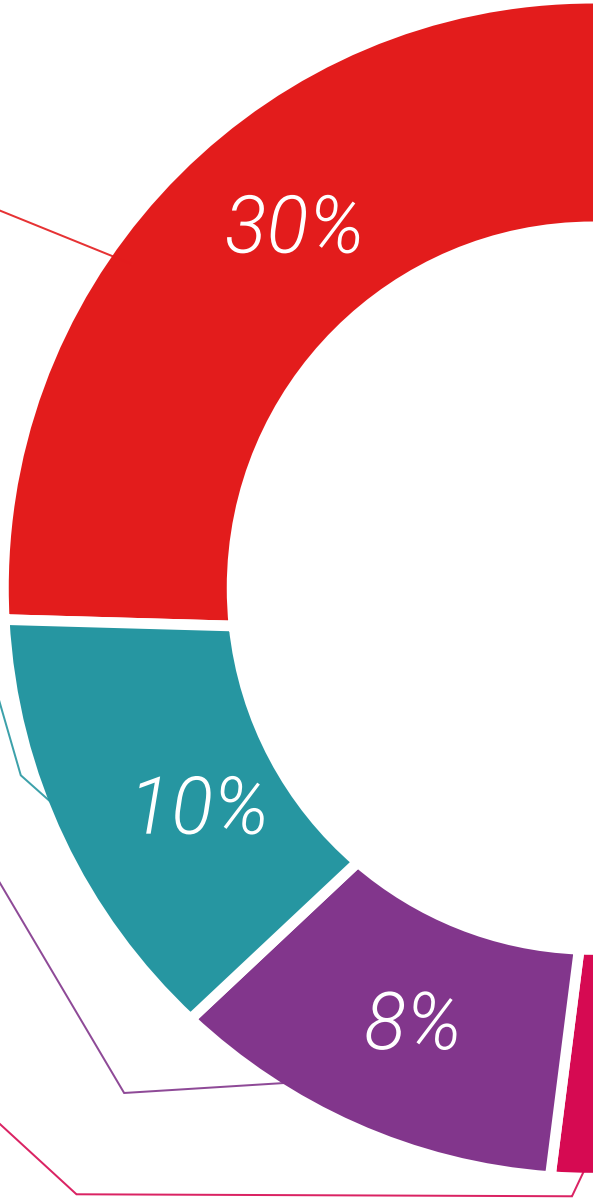
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

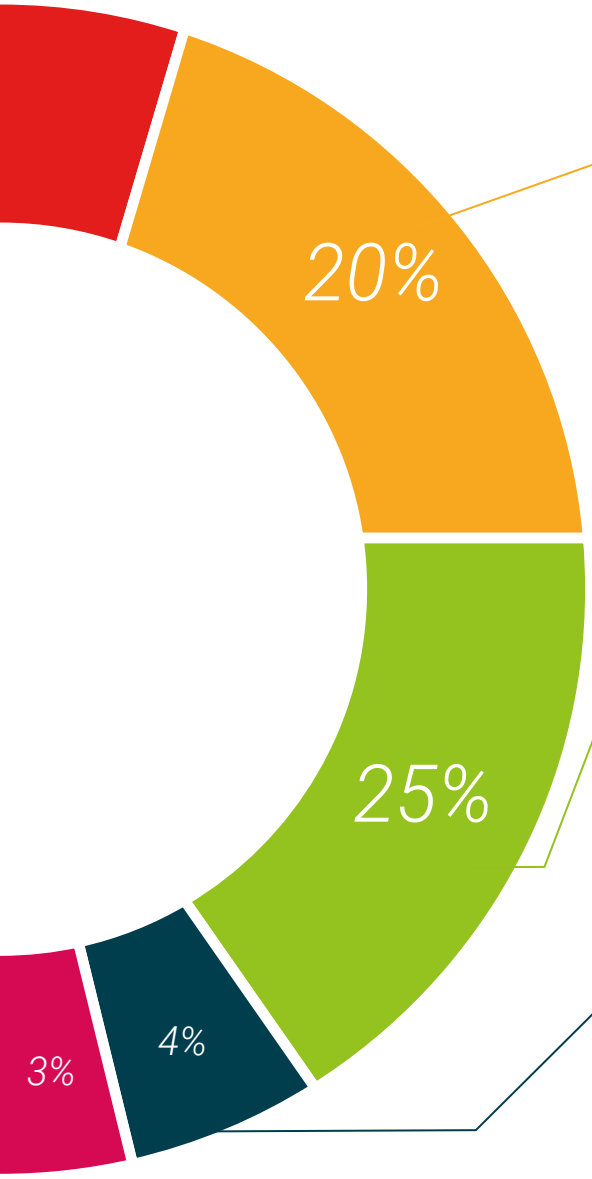
Practising Skills and Abilities

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 Professional Master's Degree in Computing and Programming Languages guarantees students, in addition to the most rigorous and up-to-date education, access to a Professional Master's Degree issued by TECH Technological University.

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

This **Professional Master's Degree in Computing and Programming Languages** contains the most complete and up-to-date program on the market.

After the student has passed the assessments, they will receive their corresponding **Professional Master's Degree** issued by **TECH Technological University** via tracked delivery*.

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

Title: **Professional Master's Degree in Computing and Programming Languages**

Official Nº of hours: **1,500 h.**


tech technological university

Awards the following

CERTIFICATE

to

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

For having successfully passed and accredited the following program

PROFESSIONAL MASTER'S DEGREE

in

Computing and Programming Languages

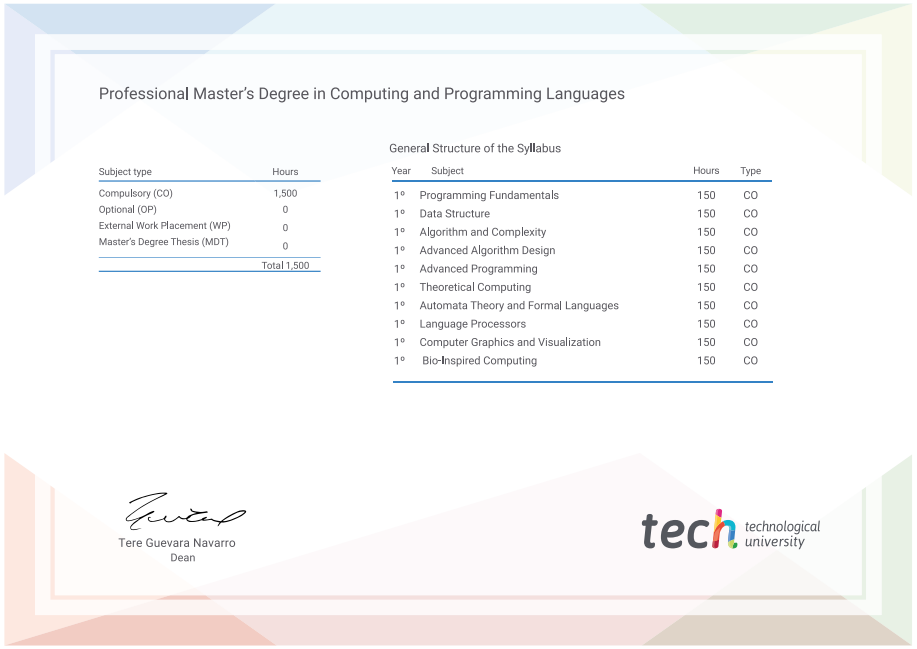
This is a qualification awarded by this University, equivalent to 1,500 hours, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

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


Professional Master's Degree in Computing and Programming Languages

Subject type	Hours
Compulsory (CO)	1,500
Optional (OP)	0
External Work Placement (WP)	0
Master's Degree Thesis (MDT)	0
	Total 1,500

General Structure of the Syllabus

Year	Subject	Hours	Type
1º	Programming Fundamentals	150	CO
1º	Data Structure	150	CO
1º	Algorithm and Complexity	150	CO
1º	Advanced Algorithm Design	150	CO
1º	Advanced Programming	150	CO
1º	Theoretical Computing	150	CO
1º	Automata Theory and Formal Languages	150	CO
1º	Language Processors	150	CO
1º	Computer Graphics and Visualization	150	CO
1º	Bio-Inspired Computing	150	CO

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Dean

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*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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Professional Master's Degree

Computing and Programming Languages

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

Professional Master's Degree

Computing and Programming Languages

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