Postgraduate Certificate
Algorithms and Data Structures with Python from Scratch

tech global university

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Postgraduate Certificate
Algorithms and Data Structures with Python from Scratch

- » Modality: **online**
- » Duration: **6 weeks**
- » Certificate: **TECH Global University**
- » Accreditation: **6 ECTS**
- » Schedule: **at your own pace**
- » Exams: **online**

Website: **www.techtitute.com/us/information-technology/postgraduate-certificate/algorithms-data-structures-python-scratch**

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01
Introduction to the Program

In today's world, algorithms and data structures are fundamental pillars in the development of efficient and scalable computer solutions. Renowned institutions such as the Massachusetts Institute of Technology (MIT) and Stanford University emphasize in their research that a solid understanding of these tools is essential to solve complex computational problems and optimize resources in areas such as Artificial Intelligence, data analysis and cybersecurity. Taking into account that the world of programming increasingly demands professionals with solid skills to solve complex problems efficiently, TECH has developed this Postgraduate Certificate that will provide access to up-to-date content, guided by experts in computer science and programming. All this, through an innovative 100% online methodology.

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You will master algorithms and data structures from scratch with Python. At TECH we offer you a 100% online Postgraduate Certificate, flexible and adapted to your needs. Enroll today and take your career to the next level!"

Algorithms and Data Structures are at the core of modern programming, as they allow complex problems to be solved efficiently. In this sense, Python, recognized for its simple syntax and versatility, has become the ideal tool for tackling these concepts from scratch. This language is widely used in areas such as data analysis, artificial intelligence and software development. Therefore, mastering these techniques from their foundations is essential for those who want to excel in the technological field.

To respond to this need, TECH has developed this program in Algorithms and Data Structures with Python that will offer an innovative and structured syllabus. Throughout the program, designed with a comprehensive approach, key topics such as lists, stacks, queues, trees, graphs, and search and sorting algorithms will be explored in depth. In this way, the proposed module will combine theoretical foundations with practical exercises designed to facilitate the understanding and immediate application of the knowledge acquired. This will prepare specialists to tackle real challenges in the world of work.

With this knowledge, graduates will be highly sought after in sectors such as technology, data science and cybersecurity. In turn, these skills will significantly increase the competitive profile of the experts, allowing them to access leadership positions in technology projects. In short, the acquisition of these skills will become a strategic investment for advancing a successful career in the field of programming and software development.

Thanks to the 100% online modality, flexibility and accessibility will be guaranteed to study from anywhere and at any time. Furthermore, the incorporation of the Relearning methodology, an innovative learning technique, will ensure the optimization of the learning process through the strategic reiteration of key concepts. In this way, TECH will provide an unparalleled educational experience, tailored to the needs of today's students and designed to maximize professional success.

This **Postgraduate Certificate in Algorithms and Data Structures with Python from Scratch** contains the most complete and up-to-date educational program on the market. Its most notable features are:

- The development of case studies presented by experts in programming
- The graphic, schematic, and practical contents with which they are created, provide scientific and practical information on the disciplines that are essential for professional practice
- Practical exercises where the self-assessment process can be carried out to improve learning
- Special emphasis on innovative methodologies in Algorithms and Data Structures with Python from Scratch
- 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

Are you ready to take the next step in your technology career? With this Postgraduate Certificate you will prepare in a practical way and completely online, with the Relearning methodology that will ensure you assimilate the key concepts"

Would you like to master algorithms and data structures with Python? This TECH Postgraduate Certificate is the ideal option for you. Here you will find everything you need to know, with flexible and efficient training"

With this Postgraduate Certificate you will understand the essential foundations that every programmer must master. Through the Relearning methodology you will receive a complete, dynamic and practical training.

Conquer the world of programming! In this program you will master everything from the basics to advanced techniques with the best teachers and an up-to-date syllabus. All at your own pace, 100% online.
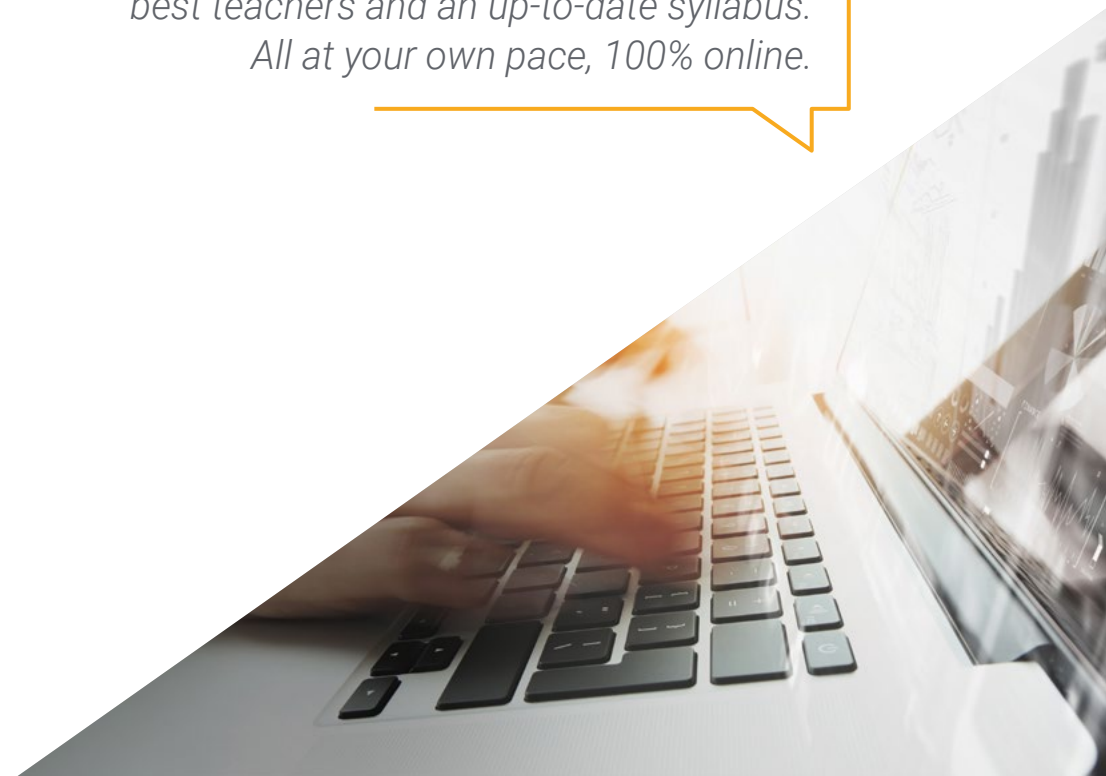
Its teaching staff includes professionals from the field of programming, who bring their work experience to this program, as well as renowned specialists from leading companies and prestigious universities.

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 learning experience designed to prepare for real-life situations.

This program is designed around Problem-Based Learning, whereby the student must try to solve the different professional practice situations that arise throughout the program. For this purpose, the professional will be assisted by an innovative interactive video system created by renowned and experienced experts.

02
Why Study at TECH?

TECH is the world's largest online university. With an impressive catalog of more than 14,000 university programs available in 11 languages, it is positioned as a leader in employability, with a 99% job placement rate. In addition, it relies on an enormous faculty of more than 6,000 professors of the highest international renown.

Study at the world's largest online university and guarantee your professional success. The future starts at TECH"

tech

The world's best online university, according to FORBES

The prestigious Forbes magazine, specialized in business and finance, has highlighted TECH as "the best online university in the world" This is what they have recently stated in an article in their digital edition in which they echo the success story of this institution, "thanks to the academic offer it provides, the selection of its teaching staff, and an innovative learning method oriented to form the professionals of the future".

The best top international faculty

TECH's faculty is made up of more than 6,000 professors of the highest international prestige. Professors, researchers and top executives of multinational companies, including Isaiah Covington, performance coach of the Boston Celtics; Magda Romanska, principal investigator at Harvard MetaLAB; Ignacio Wistumba, chairman of the department of translational molecular pathology at MD Anderson Cancer Center; and D.W. Pine, creative director of TIME magazine, among others.

The world's largest online university

TECH is the world's largest online university. We are the largest educational institution, with the best and widest digital educational catalog, one hundred percent online and covering most areas of knowledge. We offer the largest selection of our own degrees and accredited online undergraduate and postgraduate degrees. In total, more than 14,000 university programs, in ten different languages, making us the largest educational institution in the world.

Forbes
The best online university in the world

The most complete **syllabus**

TOP international faculty

The most effective methodology

World's No.1 The World's largest online university

The most complete syllabuses on the university scene

TECH offers the most complete syllabuses on the university scene, with programs that cover fundamental concepts and, at the same time, the main scientific advances in their specific scientific areas. In addition, these programs are continuously updated to guarantee students the academic vanguard and the most demanded professional skills. and the most in-demand professional competencies. In this way, the university's qualifications provide its graduates with a significant advantage to propel their careers to success.

A unique learning method

TECH is the first university to use Relearning in all its programs. This is the best online learning methodology, accredited with international teaching quality certifications, provided by prestigious educational agencies. In addition, this innovative academic model is complemented by the "Case Method", thereby configuring a unique online teaching strategy. Innovative teaching resources are also implemented, including detailed videos, infographics and interactive summaries.

The official online university of the NBA

TECH is the official online university of the NBA. Thanks to our agreement with the biggest league in basketball, we offer our students exclusive university programs, as well as a wide variety of educational resources focused on the business of the league and other areas of the sports industry. Each program is made up of a uniquely designed syllabus and features exceptional guest hosts: professionals with a distinguished sports background who will offer their expertise on the most relevant topics.

Leaders in employability

TECH has become the leading university in employability. Ninety-nine percent of its students obtain jobs in the academic field they have studied within one year of completing any of the university's programs. A similar number achieve immediate career enhancement. All this thanks to a study methodology that bases its effectiveness on the acquisition of practical skills, which are absolutely necessary for professional development.

Google Partner
PREMIER 2023

NBA
The Official Online University of the **NBA**

4.9/5
★★★★★
★global score

99%
maximun employability guaranteed

Google Premier Partner

The American technology giant has awarded TECH the Google Premier Partner badge. This award, which is only available to 3% of the world's companies, highlights the efficient, flexible and tailored experience that this university provides to students. The recognition not only accredits the maximum rigor, performance and investment in TECH's digital infrastructures, but also places this university as one of the world's leading technology companies.

The top-rated university by its students

Students have positioned TECH as the world's top-rated university on the main review websites, with a highest rating of 4.9 out of 5, obtained from more than 1,000 reviews. These results consolidate TECH as the benchmark university institution at an international level, reflecting the excellence and positive impact of its educational model.
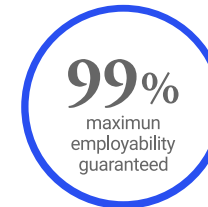
03
Syllabus

Throughout a comprehensive syllabus, designed by industry experts, professionals will become familiar with fundamental structures such as lists, stacks, queues, trees and graphs, as well as mastering the most commonly used search and sorting algorithms. In turn, there will be an in-depth look at the implementation of dynamic or greedy programming algorithms and advanced techniques such as graph algorithms (Dijkstra, BFS, DFS). Finally, emphasis will be placed on algorithmic complexity (Big O analysis), which will help graduates understand the efficiency of algorithms and their impact on application performance.
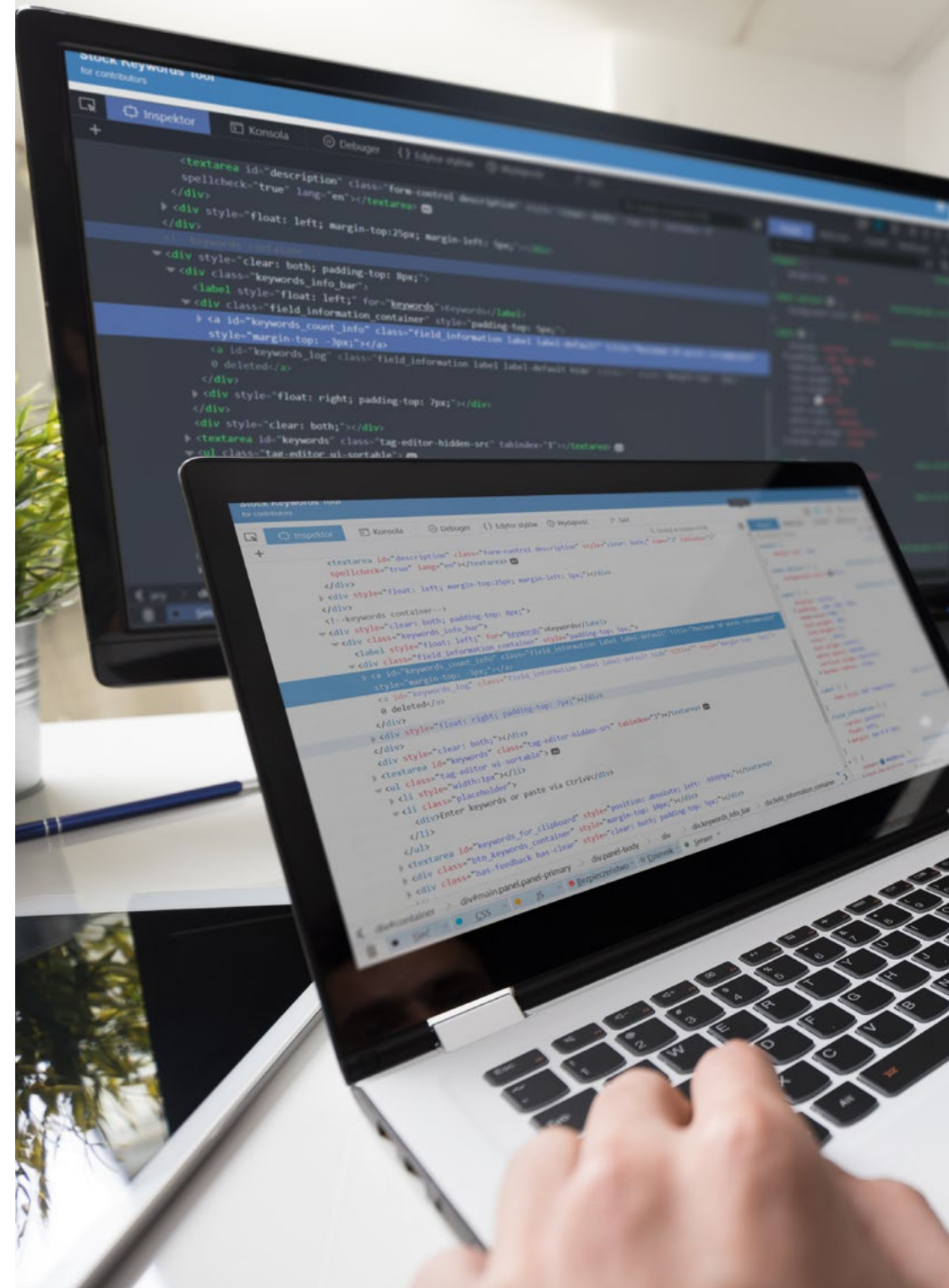
Thanks to the guidance of expert professors and up-to-date content, you will receive all the tools necessary to enhance your professional profile and address the technological challenges of the future"

Module 1. Back-End Development II - Algorithms and Data Structures with Python from Scratch

1.1.   Search Algorithms in Data Structures
    1.1.1.   Purpose of Search Algorithms in Data Structures
    1.1.2.   Linear Search: Implementation and Use Cases
    1.1.3.   Binary Search: Examples
    1.1.4.   Efficiency Comparison: Linear vs Binary Search

1.2.   Sorting Algorithms in Data Structures (I). Basic Sorting Techniques Bubble Sort and Insertion Sort
    1.2.1.   Bubble Sort: Implementation and Analysis
    1.2.2.   Insertion Sort: Implementation and Use Cases
    1.2.3.   Comparison between Bubble Sort and Insertion Sort

1.3.   Sorting Algorithms in Data Structures (II). Advanced Sorting Techniques: Selection Sort, Merge Sort and Quick Sort
    1.3.1.   Selection Sort. Implementation and Analysis
    1.3.2.   Merge Sort: Implementation
    1.3.3.   Quick Sort: Implementation
    1.3.4.   Comparison of Efficiency between Sorting Algorithms

1.4.   Recursive Algorithms for Searching in Data Structures
    1.4.1.   Recursion. Use
    1.4.2.   Direct and Indirect Recursion
    1.4.3.   Recursive Algorithms: Factorial and Fibonacci. Examples

1.5.   Complexity of Search Algorithms in Data Structures
    1.5.1.   Algorithmic Complexity. Efficiency Measurement
    1.5.2.   Big-O Notation
    1.5.3.   Complexity Analysis in Search and Sorting Algorithms

1.6.   Advanced Data Structures
    1.6.1.   Trees: Terminology
    1.6.2.   Binary Trees: Operations
    1.6.3.   Binary Search Trees (BST): Search, Insertion and Deletion

You will study at your own pace and have access to exclusive content that will prepare you for the most demanding challenges in the world of technology. What are you waiting for to enroll? Start today and transform your future"

Teaching Objectives

The main objective of this program is to provide fundamental knowledge to understand and apply the algorithms and data structures most commonly used in programming. Throughout the program, specialists will learn how to design efficient solutions to complex problems, developing a solid understanding of how to organize and manipulate data to optimize application performance. In this way, they will acquire key programming skills, from the most basic to the most advanced concepts, without the need for prior knowledge in the subject.

"

The practical and results-oriented approach will provide you with the necessary tools to excel in the competitive world of programming and computer engineering"

General Objectives

- Understand the basic concepts of algorithms and data structures
- Identify and analyze computational problems to design efficient solutions
- Apply data structures such as lists, stacks, queues and trees in Python
- Design and develop algorithms using structured programming techniques
- Implement search and sorting algorithms in practical projects
- Optimize the efficiency and performance of algorithmic solutions in Python
- Solve complex problems by integrating appropriate data structures
- Use debugging and testing practices to ensure code functionality
- Adapt algorithmic solutions to different computational contexts and scenarios
- Develop logical thinking and skills to address programming challenges

Specific Objectives

- Implement and compare types of search algorithms in data structures
- Analyze sorting algorithms such as bubble, insertion, selection, merge sort and quick sort
- Develop the concept of recursion and its application in problem solving
- Examine algorithmic complexity and efficiency measurement using Big O notation

Benefit from the online modality and start building your future today. Join TECH now and acquire the skills that today's market demands. Your future in programming starts here!"

05
Study Methodology

TECH is the world's first university to combine the **case study** methodology with **Relearning**, a 100% online learning system based on guided repetition.

This disruptive pedagogical strategy has been conceived to offer professionals the opportunity to update their knowledge and develop their skills in an intensive and rigorous way. A learning model that places students at the center of the educational process giving them the leading role, adapting to their needs and leaving aside more conventional methodologies.

"

TECH will prepare you to face new challenges in uncertain environments and achieve success in your career"

The student: the priority of all TECH programs

In TECH's study methodology, the student is the main protagonist.
The teaching tools of each program have been selected taking into account the demands of time, availability and academic rigor that, today, not only students demand but also the most competitive positions in the market.

With TECH's asynchronous educational model, it is students who choose the time they dedicate to study, how they decide to establish their routines, and all this from the comfort of the electronic device of their choice. The student will not have to participate in live classes, which in many cases they will not be able to attend. The learning activities will be done when it is convenient for them. They can always decide when and from where they want to study.

At TECH you will NOT have live classes (which you might not be able to attend)"

The most comprehensive study plans at the international level

TECH is distinguished by offering the most complete academic itineraries on the university scene. This comprehensiveness is achieved through the creation of syllabi that not only cover the essential knowledge, but also the most recent innovations in each area.

By being constantly up to date, these programs allow students to keep up with market changes and acquire the skills most valued by employers. In this way, those who complete their studies at TECH receive a comprehensive education that provides them with a notable competitive advantage to further their careers.

And what's more, they will be able to do so from any device, pc, tablet or smartphone.

TECH's model is asynchronous, so it allows you to study with your pc, tablet or your smartphone wherever you want, whenever you want and for as long as you want"

Case Studies and Case Method

The case method has been the learning system most used by the world's best business schools. Developed in 1912 so that law students would not only learn the law based on theoretical content, its function was also to present them with real complex situations. In this way, they could make informed decisions and value judgments about how to resolve them. In 1924, Harvard adopted it as a standard teaching method.

With this teaching model, it is students themselves who build their professional competence through strategies such as Learning by Doing or Design Thinking, used by other renowned institutions such as Yale or Stanford.

This action-oriented method will be applied throughout the entire academic itinerary that the student undertakes with TECH. Students will be confronted with multiple real-life situations and will have to integrate knowledge, research, discuss and defend their ideas and decisions. All this with the premise of answering the question of how they would act when facing specific events of complexity in their daily work.

Relearning Methodology

At TECH, case studies are enhanced with the best 100% online teaching method: Relearning.

This method breaks with traditional teaching techniques to put the student at the center of the equation, providing the best content in different formats. In this way, it manages to review and reiterate the key concepts of each subject and learn to apply them in a real context.

In the same line, and according to multiple scientific researches, reiteration is the best way to learn. For this reason, TECH offers between 8 and 16 repetitions of each key concept within the same lesson, presented in a different way, with the objective of ensuring that the knowledge is completely consolidated during the study process.

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

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)

A 100% online Virtual Campus with the best teaching resources

In order to apply its methodology effectively, TECH focuses on providing graduates with teaching materials in different formats: texts, interactive videos, illustrations and knowledge maps, among others. All of them are designed by qualified teachers who focus their work on combining real cases with the resolution of complex situations through simulation, the study of contexts applied to each professional career and learning based on repetition, through audios, presentations, animations, images, etc.

The latest scientific evidence in the field of Neuroscience points to the importance of taking into account the place and context where the content is accessed before starting a new learning process. Being able to adjust these variables in a personalized way helps people to remember and store knowledge in the hippocampus to retain it in the long term. This is a model called Neurocognitive context-dependent e-learning that is consciously applied in this university qualification.

In order to facilitate tutor-student contact as much as possible, you will have a wide range of communication possibilities, both in real time and delayed (internal messaging, telephone answering service, email contact with the technical secretary, chat and videoconferences).

Likewise, this very complete Virtual Campus will allow TECH students to organize their study schedules according to their personal availability or work obligations. In this way, they will have global control of the academic content and teaching tools, based on their fast-paced professional update.

The online study mode of this program will allow you to organize your time and learning pace, adapting it to your schedule"

The effectiveness of the method is justified by four fundamental achievements:

1. Students who follow this method not only achieve the assimilation of concepts, but also a development of their mental capacity, through exercises that assess real situations and the application of knowledge.

2. Learning is solidly translated into practical skills that allow the student to better integrate into the real world.

3. Ideas and concepts are understood more efficiently, given that the example situations are based on real-life.

4. Students like to feel that the effort they put into their studies is worthwhile. This then translates into a greater interest in learning and more time dedicated to working on the course.

The university methodology top-rated by its students

The results of this innovative teaching model can be seen in the overall satisfaction levels of TECH graduates.

The students' assessment of the teaching quality, the quality of the materials, the structure of the program and its objectives is excellent. Not surprisingly, the institution became the top-rated university by its students according to the global score index, obtaining a 4.9 out of 5.

Access the study contents from any device with an Internet connection (computer, tablet, smartphone) thanks to the fact that TECH is at the forefront of technology and teaching.

You will be able to learn with the advantages that come with having access to simulated learning environments and the learning by observation approach, that is, Learning from an expert.

As such, the best educational materials, thoroughly prepared, will be available in this program:

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.

This content is then adapted in an audiovisual format that will create our way of working online, with the latest techniques that allow us to offer you high quality in all of the material that we provide you with.

Practicing Skills and Abilities

You will carry out activities to develop specific competencies and skills in each thematic field. Exercises and activities to acquire and develop the skills and abilities that a specialist needs to develop within the framework of the globalization we live in.

Interactive Summaries

We present 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".

Additional Reading

Recent articles, consensus documents, international guides… In our virtual library you will have access to everything you need to complete your education.

20%

15%

15%

3%

20%

17%

7%

3%

Case Studies

Students will complete a selection of the best case studies in the field. Cases that are presented, analyzed, and supervised by the best specialists in the world.

Testing & Retesting

We periodically assess and re-assess your knowledge throughout the program. We do this on 3 of the 4 levels of Miller's Pyramid.

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 for future difficult decisions.

Quick Action Guides

TECH offers the most relevant contents of the course in the form of worksheets or quick action guides. A synthetic, practical and effective way to help students progress in their learning.

Teaching Staff

The teaching staff is made up of a team of highly qualified professionals with extensive experience in the field of programming and computer science. In fact, they not only have a high level of academic background, but also have an outstanding professional career in various areas of computer science, which allows them to offer a practical and up-to-date perspective on the concepts and techniques taught in the program. Thanks to their experience in renowned companies and projects, the mentors are in constant contact with the latest technology trends.

With their experience, dedication and practical approach, TECH professors become exceptional guides, providing you with the technical knowledge and tools necessary to apply your knowledge effectively"

Management

Dr. Lucas Cuesta, Juan Manuel

- Senior Software Engineer and Analyst at Indizen – Believe in Talent
- Senior Software Engineer and Analyst at Krell Consulting and IMAGiNA Artificial Intelligence
- Software Engineer at Intel Corporation
- Software Engineer at Intelligent Dialog Systems
- PhD in Electronic Systems Engineering for Intelligent Environments from the Polytechnic University of Madrid
- Graduate in Telecommunications Engineering at the Polytechnic University of Madrid
- Master's Degree in Electronic Systems Engineering for Intelligent Environments from the Polytechnic University of Madrid

Mr. Márquez Ruiz de Lacanal, Juan Antonio

- Software Developer at GTD Defense & Security Solutions
- Software Developer at Solera Inc
- Development and Research Engineer at GRVC Sevilla
- Co-founder of Unmute
- Co-founder of VR Educa
- Academic Exchange in Engineering and Entrepreneurship at the University of California, Berkeley
- Degree in Industrial Engineering from the University of Sevilla

Professors

Mr. Grillo Hernández, José Enrique

- Application Developer and Technology Analyst
- Senior Mobile Applications Developer at Globant
- Android Developer at Plexus Tech
- Senior Android Developer at RoadStr
- Senior Mobile Developer at Avantgarde IT-Information Technology Services
- Project Leader at Smartdess
- Developer at Educatablet
- Technology Analyst at Corporate Mobile Solutions
- Master's Degree in System Engineering from the Simón Bolívar University

A unique, key and decisive learning experience to boost your professional development"

Certificate

This Postgraduate Certificate in Algorithms and Data Structures with Python from Scratch guarantees, in addition to the most rigorous and up-to-date program, access to an Postgraduate Certificate 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 private qualification will allow you to obtain a diploma for the **Postgraduate Certificate in Algorithms and Data Structures with Python from Scratch** 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.
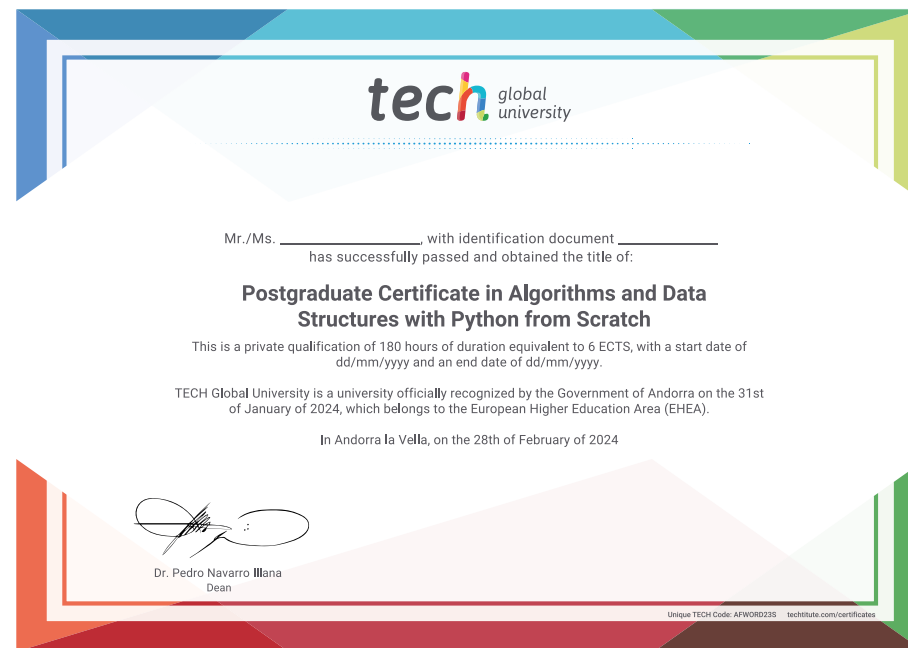
This **TECH Global University** private qualification, is a European program of continuing education and professional updating that guarantees the acquisition of competencies in its area of knowledge, providing a high curricular value to the student who completes the program.

Title: **Postgraduate Certificate in Algorithms and Data Structures with Python from Scratch**

Modality: **online**

Duration: **6 weeks**

Accreditation: **6 ECTS**

tech global university

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

Postgraduate Certificate in Algorithms and Data Structures with Python from Scratch

This is a private qualification of 180 hours of duration equivalent to 6 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
Dean

Unique TECH Code: AFWORD23S   techtitute.com/certificates

*Apostille Convention. In the event that the student wishes to have their paper diploma issued with an apostille, TECH Global University will make the necessary arrangements to obtain it, at an additional cost.

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tec**h** global
university