

# Postgraduate Diploma Blockchain Development



## Postgraduate Diploma Blockchain Development

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

Website: [www.techtute.com/us/information-technology/postgraduate-diploma/postgraduate-diploma-blockchain-development](http://www.techtute.com/us/information-technology/postgraduate-diploma/postgraduate-diploma-blockchain-development)

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# 01

# Introduction

The new big application of programming is blockchain technology. This is a field full of possibilities in which all large and small development companies are turning to. As such, the blockchain makes it possible to record operations and transactions, but it also has multiple other uses in all kinds of fields such as aeronautics or law. For that reason, developers specialized in blockchain are increasingly in demand and this qualification provides them with all the necessary tools to delve deeper into this area and become outstanding programmers.



“

*Learn thanks to this program all the secrets to develop in blockchain environments and advance your career as a programmer”*

The blockchain has arrived to revolutionize the technological world. Although its name was initially associated exclusively with cryptocurrencies, it has now proven its effectiveness in numerous fields. For this reason, large digital companies are already building powerful blockchain development departments in order to position themselves as leaders in this area.

In this way, specializing in programming for blockchain at this time can open the door to numerous opportunities, and this Postgraduate Diploma takes advantage of that juncture to provide the professional with all the necessary knowledge to become a specialist in the field, so that they can progress in their own company or have access to the largest technology companies in the world.

Therefore, this qualification provides, among other things, in-depth knowledge of clients such as Hyperledger Fabric and Hyperledger Besu, so that the computer scientist has the best tools to be able to program effectively in this area. To make this process even more effective, this program is offered in a 100% online format, so that those who take it can balance their professional career with their studies. All of this is supported by innovative multimedia materials to facilitate the learning process.

This **Postgraduate Diploma in Blockchain Development** contains the most complete and up-to-date educational program on the market. Its most notable features are:

- ◆ The development of practical cases presented by Blockchain experts
- ◆ 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 self-assessment can be used to improve learning
- ◆ Its special emphasis on innovative methodologies
- ◆ 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



*Develop innovative blockchain projects thanks to all the knowledge you will acquire in this Postgraduate Diploma”*

“

*This Postgraduate Diploma will allow you to program the best tools in the blockchain domain for an independent business or for a large company”*

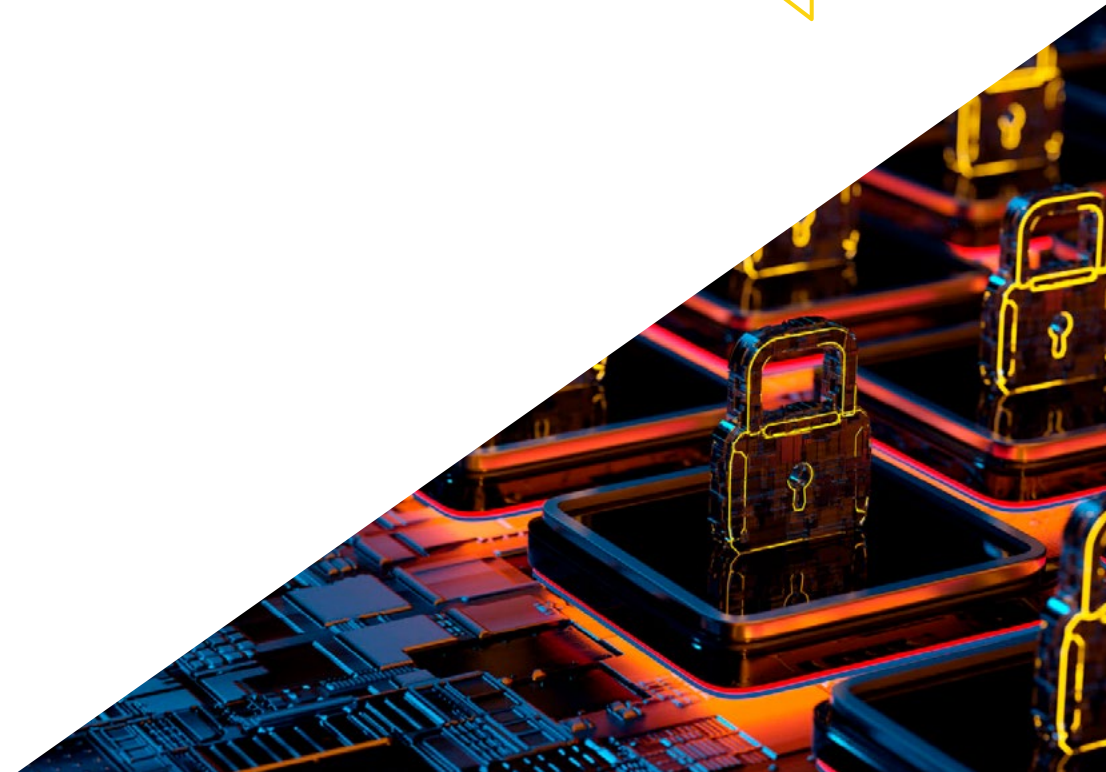
*Achieve the professional progress you are looking for with this Postgraduate Diploma.*

*Blockchain is the present and the future. Don't wait any longer and enroll.*

The program's teaching staff includes professionals from the sector who contribute their work experience to this training program, as well as renowned specialists from leading 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 immersive training programmed 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 student will be assisted by an innovative interactive video system created by renowned and experienced experts.



# 02 Objectives

The main objective of this Postgraduate Diploma in Blockchain Development is to provide the computer scientists with all the tools to develop effectively in this type of environment, so that they will be able to build any type of programming project applied to this technology. As a result, at the end of the qualification, the professional will have acquired all the skills and tools to work in this field with all the guarantees.







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*Become the best blockchain programmer in your environment thanks to the new tools you will acquire in this program”*



## General Objectives

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- ◆ Generate specialized knowledge about Ethereum as a public blockchain
- ◆ Examine the Stellar platform
- ◆ Specialize computer engineers in Polkadot and Substrate
- ◆ Analyze the future impact of running public blockchains
- ◆ Develop design criteria for applications on production Hyperledger Besu clients
- ◆ Provide a foundation in the management and configuration of Hyperledger Besu-based networks
- ◆ Promote best practices when developing applications with dependency on Blockchain networks, particularly those based on Ethereum and on Hyperledger Besu client
- ◆ Integrate the student's existing knowledge in a refined way based on the needs of industry and business with their notions of quality, effort measurement and development valuation, expanding their value as a Blockchain application developer.
- ◆ Generate specialized knowledge about what Hyperledger Fabric encompasses and how it works
- ◆ Examine the resources that Hyperledger provides free of charge
- ◆ Analyze the features of Hyperledger Fabric
- ◆ Facing the deployment of a Hyperledger Fabric project
- ◆ Develop Fabric's current main application case studies





## Specific Objectives

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### Module 1. Public Blockchain Development: Ethereum, Stellar and Polkadot

- ◆ Broaden skills in the world of blockchain development
- ◆ Develop practical examples based on cases
- ◆ Compile generic knowledge about blockchains in practice
- ◆ Analyze the operation of a public blockchain
- ◆ Gain experience in Solidity
- ◆ Establish a relationship between the different public Blockchains.
- ◆ Create a project on a public Blockchain

### Module 2. Corporate Blockchain Development: Hyperledger Besu

- ◆ Identify key configuration points in the consensus protocols available with Hyperledger Besu
- ◆ Correctly measure a Hyperledger Besu service to support enterprise applications
- ◆ Develop automated test protocols for quality validation in Hyperledger Besu environments
- ◆ Establish safety criteria for a production environment with Hyperledger Besu
- ◆ Compile the different types of configurations on Hyperledger Besu clients
- ◆ Determining the sizing criteria for an application with Hyperledger Besu
- ◆ Strengthen knowledge of the functioning of the consensus mechanisms implemented in Hyperledger Besu
- ◆ Define the most interesting technological Stack in the implementation of infrastructure and development of applications based on Hyperledger Besu

### Module 3. Corporate Blockchain Development: Hyperledger Fabric

- ◆ Generate specialized knowledge about Hyperledger and Fabric
- ◆ Analyze what can be done with this technology
- ◆ Determine the inner workings of transactions
- ◆ Solve a problem with Fabric
- ◆ Deploy Fabric
- ◆ Gain experience in Fabric deployments



*Your professional goals are within reach: enroll now”*

# 03

## Course Management

The most specialized and expert teaching staff transmits to the students all the keys to develop successfully in the blockchain environment. As such, this is one of the strengths of this qualification, so that the computer scientist has the opportunity to have access to active professionals who work in this field and who have in-depth knowledge of all the latest developments in the field. This ensures that at the end of the program the computer scientists will be able to apply everything they have learned in their work environment.



“

*You will have access to a high-level teaching staff composed of working professionals developing blockchain projects”*

## International Guest Director

Chris Sutton is a leading professional with extensive experience in the field of technology and finance, specializing in the Blockchain area. In fact, he has held the senior position of Director of the Blockchain and Digital Assets Department at Mastercard. In addition, he has been the Founder of the consulting firm N17 Capital, in which he offers advice to companies in the field of Blockchain and digital assets. So, one of his functions has been to identify the components that make up these new tools, analyze them and create working strategies.

His professional experience has included high-level roles in leading companies in the sector, such as Oasis Pro Market, where he has performed duties as Director of Blockchain Services. In addition, he has worked as Mergers and Acquisitions Product Manager at Cisco, and as Product Manager at IBM. These positions have allowed him to stand out internationally for his ability to lead teams, develop innovative strategies and manage large-scale projects.

Throughout his career, he has participated in important technological and financial events. In this sense, Chris Sutton has given presentations and has been part of international panels, along with other leading experts in this sector. In this way, on the occasion of the 15th anniversary of the white paper on Bitcoin, he participated in the events of the FinTech week in Hong Kong. He also presented his expertise at a conference organized by Mastercard in Dubai on banking in the digital age and the impact of digital assets. Likewise, his analyses have focused on delving into the history, principles and future of the Blockchain.

In short, his strategic vision and outstanding skills in programming and algorithms have been key to his success in the international market, consolidating him as a leader in his field.



## D. Sutton, Chris

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- Director of Blockchain and Digital Assets at Mastercard, Miami, U.S.A.
- Founder of N17 Capital
- Director of Blockchain Services at Oasis Pro Market
- Mergers and Acquisitions Product Manager at Cisco
- Product Manager at IBM
- Contributor at Cointelegraph
- Master's degree in Financial Systems Engineering from University College London
- Bachelor's Degree in Computer Science from Florida International University

“

*Thanks to TECH, you will be able to learn with the best professionals in the world”*

## Management



### Mr. Torres Palomino, Sergio

- Blockchain Architect Telefónica
- Blockchain Architect Signeblock
- Blockchain Developer Blocknitive
- Big Data Engineer Golive Services
- Big Data Engineer IECISA
- Degree in Computer Engineering from San Pablo CEU University
- Master's Degree in Big Data Architecture
- Master's Degree in Big Data and Business Analytics





## Professors

### Mr. García de la Mata, Íñigo

- ◆ Architecture Leader at Grant Thornton, Innovation Department
- ◆ Bachelor's Degree in Industrial Engineering with a Major in Electronics
- ◆ Industrial Engineering, Master's Degree in Electronics from Universidad Pontificia de Comillas
- ◆ Degree in Computer Engineering from UNED
- ◆ Lecturer in Blockchain University courses at UNIR
- ◆ Lecturer and Blockchain Bootcamp and Geekshub
- ◆ TFG tutoring at Comillas Pontifical University

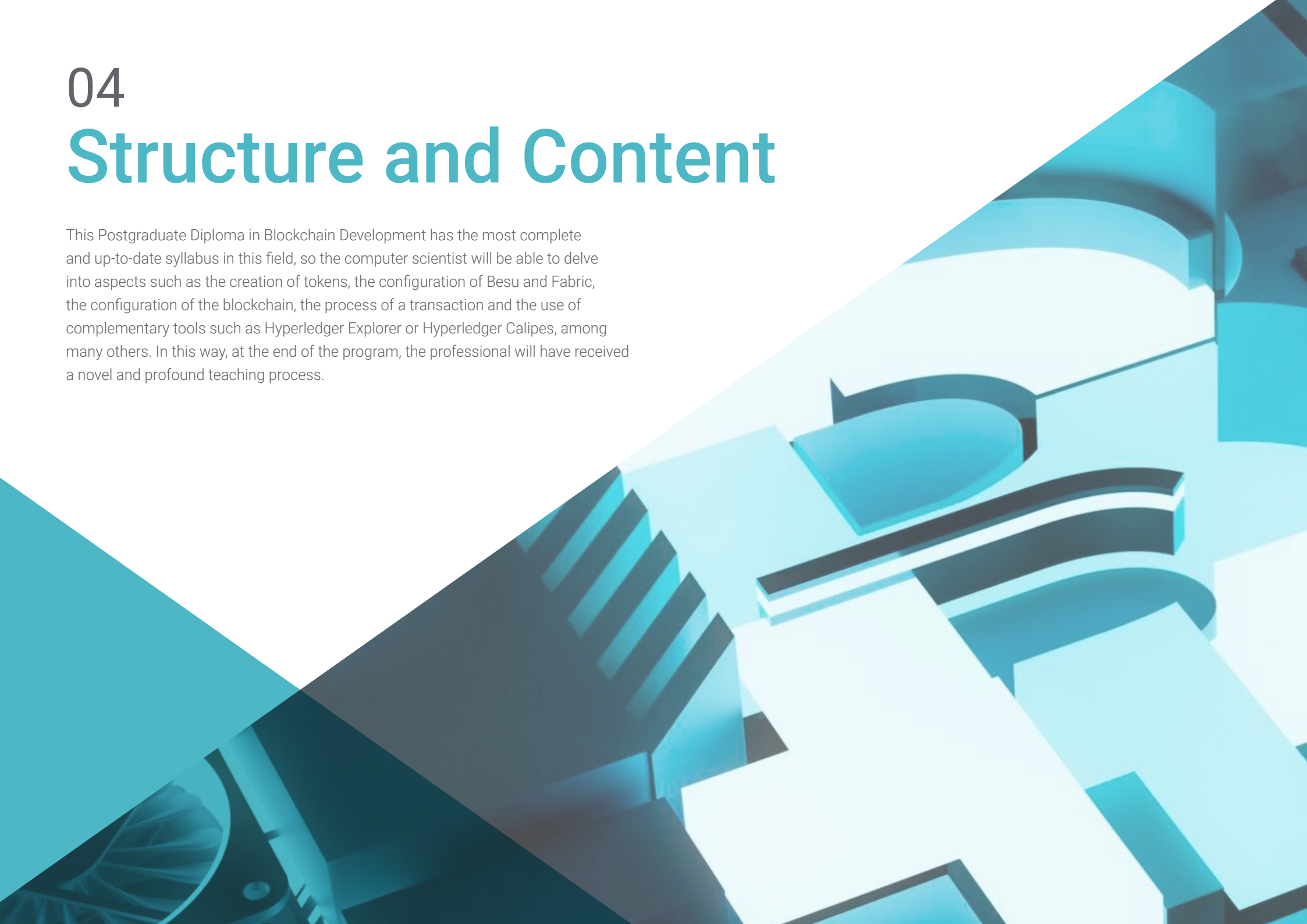
### Mr. Triguero Tirado, Enrique

- ◆ Blockchain Infrastructure Technical Manager at UPC-Threepoints
- ◆ Chief Technical Officer at Ilusiak
- ◆ Project Management Officer at Ilusiak and Deloitte
- ◆ ELK Engineer at Everis
- ◆ Systems Architect at Everis
- ◆ Degree in Technical Engineering in Computer Systems at the Polytechnic University of Valencia
- ◆ Master's Degree in Blockchain and its Business Applications from ThreePoints and the Polytechnic University of Valencia

# 04

## Structure and Content

This Postgraduate Diploma in Blockchain Development has the most complete and up-to-date syllabus in this field, so the computer scientist will be able to delve into aspects such as the creation of tokens, the configuration of Besu and Fabric, the configuration of the blockchain, the process of a transaction and the use of complementary tools such as Hyperledger Explorer or Hyperledger Caliper, among many others. In this way, at the end of the program, the professional will have received a novel and profound teaching process.



“

*Start programming or perfect yourself in the field of blockchain development and open the door to numerous opportunities in this powerful area"*

## Module 1. Public Blockchain Development: Ethereum, Stellar and Polkadot

- 1.1. Ethereum: Public Blockchain
  - 1.1.1. Ethereum
  - 1.1.2. EVM and GAS
  - 1.1.3. Etherscan
- 1.2. Running Ethereum: Solidity
  - 1.2.1. Solidity
  - 1.2.2. Remix
  - 1.2.3. Compilation and Execution
- 1.3. Ethereum Framework: Brownie
  - 1.3.1. Brownie
  - 1.3.2. Ganache
  - 1.3.3. Brownie Deployment
- 1.4. Testing smart contracts
  - 1.4.1. Test Driven Development (TDD)
  - 1.4.2. Pytest
  - 1.4.3. Smart Contracts
- 1.5. Web Connection
  - 1.5.1. Metamask
  - 1.5.2. web3.js
  - 1.5.3. Ether.js
- 1.6. Real Project: Fungible Token
  - 1.6.1. ERC1.
  - 1.6.2. Creating Our Token
  - 1.6.3. Deployment and Validation
- 1.7. Stellar Blockchain
  - 1.7.1. Stellar Blockchain
  - 1.7.2. Ecosystem
  - 1.7.3. Compared to Ethereum

- 1.8. Programming Stellar
  - 1.8.1. Horizon
  - 1.8.2. Stellar SDK
  - 1.8.3. Fungible Token Project
- 1.9. Polkadot Project
  - 1.9.1. Polkadot Project
  - 1.9.2. Ecosystem
  - 1.9.3. Interacting with Ethereum and Other Blockchains
- 1.10. Programming Polkadot
  - 1.10.1. Substrate
  - 1.10.2. Creating Parachain on Substrate
  - 1.10.3. Polkadot Integration

## Module 2. Corporate Blockchain Development: Hyperledger Besu

- 2.1. Besu Configuration
  - 2.1.1. Key Configuration Parameters in Production Environments
  - 2.1.2. Finetuning for Connected Services
  - 2.1.3. Good Configuration Practices
- 2.2. Blockchain Configuration
  - 2.2.1. Key Configuration Parameters for PoA
  - 2.2.2. Key Configuration Parameters for PoW
  - 2.2.3. Genesis Block Configurations
- 2.3. Securing Besu
  - 2.3.1. Secure the RPC with TLS
  - 2.3.2. RPC Securitization with NGINX
  - 2.3.3. Securitization by Means of a Node Scheme
- 2.4. Besu in High Availability
  - 2.4.1. Node Redundancy
  - 2.4.2. Balancers for Transactions
  - 2.4.3. Transaction Pool over Messaging Queue

- 2.5. Offchain Tools
  - 2.5.1. Privacy - Tesseract
  - 2.5.2. Identidad - Alastria ID
  - 2.5.3. Data Indexing - Subgraph
- 2.6. Applications Developed on Besu
  - 2.6.1. ERC20 Tokens-Based Applications
  - 2.6.2. ERC 721 Tokens-Based Applications
  - 2.6.3. ERC 1155 Token-Based Applications
- 2.7. Besu Deployment and Automation
  - 2.7.1. Besu about Docker
  - 2.7.2. Besu about Kubernetes
  - 2.7.3. Besu in Blockchain as a Service
- 2.8. Besu Interoperability with Other Clients
  - 2.8.1. Interoperability with Geth
  - 2.8.2. Interoperability with Open Ethereum
  - 2.8.3. Interoperability with Other DLTs
- 2.9. Plugins for Besu
  - 2.9.1. Most Common Plugins
  - 2.9.2. Plugin Development
  - 2.9.3. Installation of Plugins
- 2.10. Configuration of Development Environments
  - 2.10.1. Creation of a Developing Environment
  - 2.10.2. Creation of a Customer Integration Environment
  - 2.10.3. Creating a Pre-Production Environment for Load Testing

### Module 3. Corporate Blockchain Development: Hyperledger Fabric

- 3.1. Hyperledger
  - 3.1.1. Hyperledger Ecosystem
  - 3.1.2. Hyperledger Tools
  - 3.1.3. Hyperledger Frameworks
- 3.2. Hyperledger Fabric – Components of its Architecture. State-of-the-Art
  - 3.2.1. State of the Art of Hyperledger *Fabric*
  - 3.2.2. Nodes
  - 3.2.3. Orderers
  - 3.2.4. CouchDB and LevelDB
  - 3.2.5. CA
- 3.3. Hyperledger Fabric- Components of its Architecture. Process of a Transaction
  - 3.3.1. Process of a Transaction
  - 3.3.2. Chain Codes
  - 3.3.3. MSP
- 3.4. Enabling Technologies
  - 3.4.1. Go
  - 3.4.2. Docker
  - 3.4.3. Docker Compose
  - 3.4.4. Other Technology
- 3.5. Pre-Requisite Installation and Environment Preparation
  - 3.5.1. Server Preparation
  - 3.5.2. Download Prerequisites
  - 3.5.3. Download from Official Hyperledger Repository
- 3.6. First Deployment
  - 3.6.1. Automatic Test-Network Deployment
  - 3.6.2. Guided Test-Network Deployment
  - 3.6.3. Review of Deployed Components

- 3.7. Second Deployment
  - 3.7.1. Deployment of Private Data Collection
  - 3.7.2. Integration against a Fabric Network
  - 3.7.3. Other Projects
- 3.8. Chain Codes
  - 3.8.1. Structure of a Chaincode
  - 3.8.2. Deployment and Upgrade of Chaincodes
  - 3.8.3. Other Important Chaincode Functions
- 3.9. Connection to other Hyperledger Tools (Caliper and Explorer)
  - 3.9.1. Hyperledger Explorer Installation
  - 3.9.2. Hyperledger Caliper Installation
  - 3.9.3. Other Important Tools
- 3.10. Certification
  - 3.10.1. Types of Official Certifications
  - 3.10.2. Preparation for CHFA
  - 3.10.3. Developer vs. Administrator Profiles





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*Master Hyperledger Fabric and  
Hyperledger Besu with this  
Postgraduate Diploma”*

# 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.





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*Discover Relearning, a system that abandons conventional linear learning, to take you through cyclical teaching systems: a way of learning that has proven to be extremely effective, especially in subjects that require memorization"*

## Case Study to contextualize all content

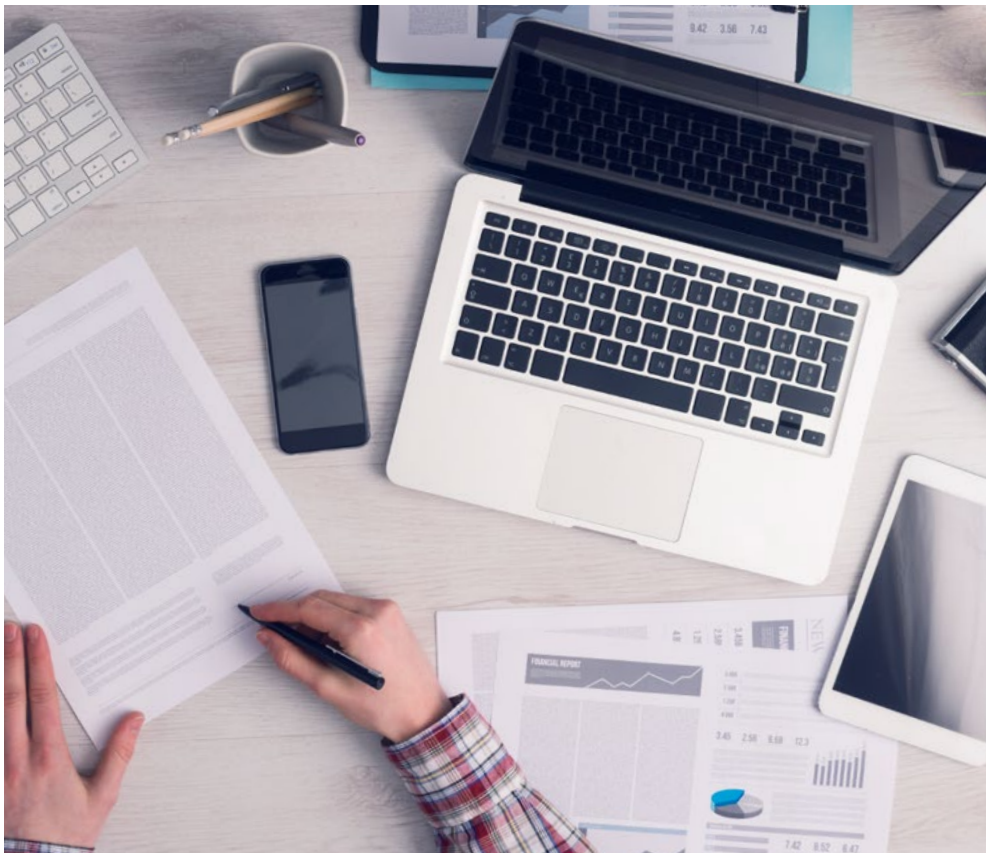
Our program offers a revolutionary approach to developing skills and knowledge. Our goal is to strengthen skills in a changing, competitive, and highly demanding environment.

“

*At TECH, you will experience a learning methodology that is shaking the foundations of traditional universities around the world"*



*You will have access to a learning system based on repetition, with natural and progressive teaching throughout the entire syllabus.*



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

### A learning method that is different and innovative

This TECH program is an intensive educational program, created from scratch, which presents the most demanding challenges and decisions in this field, both nationally and internationally. This methodology promotes personal and professional growth, representing a significant step towards success. The case method, a technique that lays the foundation for this content, ensures that the most current economic, social and professional reality is taken into account.

“*Our program prepares you to face new challenges in uncertain environments and achieve success in your career”*

The case method has been the most widely used learning system among the world's leading Information Technology schools for as long as they have existed. The case method was developed in 1912 so that law students would not only learn the law based on theoretical content. It consisted of presenting students with real-life, complex situations for them to make informed decisions and value judgments on how to resolve them. In 1924, Harvard adopted it as a standard teaching method.

What should a professional do in a given situation? This is the question that you are presented with in the case method, an action-oriented learning method. Throughout the course, students will be presented with multiple real cases. They will have to combine all their knowledge and research, and argue and defend their ideas and decisions.

## Relearning Methodology

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

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

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

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

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



In our program, learning is not a linear process, but rather a spiral (learn, unlearn, forget, and re-learn). Therefore, we combine each of these elements concentrically.

This methodology has trained more than 650,000 university graduates with unprecedented success in fields as diverse as biochemistry, genetics, surgery, international law, management skills, sports science, philosophy, law, engineering, journalism, history, and financial markets and instruments. All this in a highly demanding environment, where the students have a strong socio-economic profile and an average age of 43.5 years.

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

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

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



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



### Study Material

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

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



### Classes

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

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



### Practising Skills and Abilities

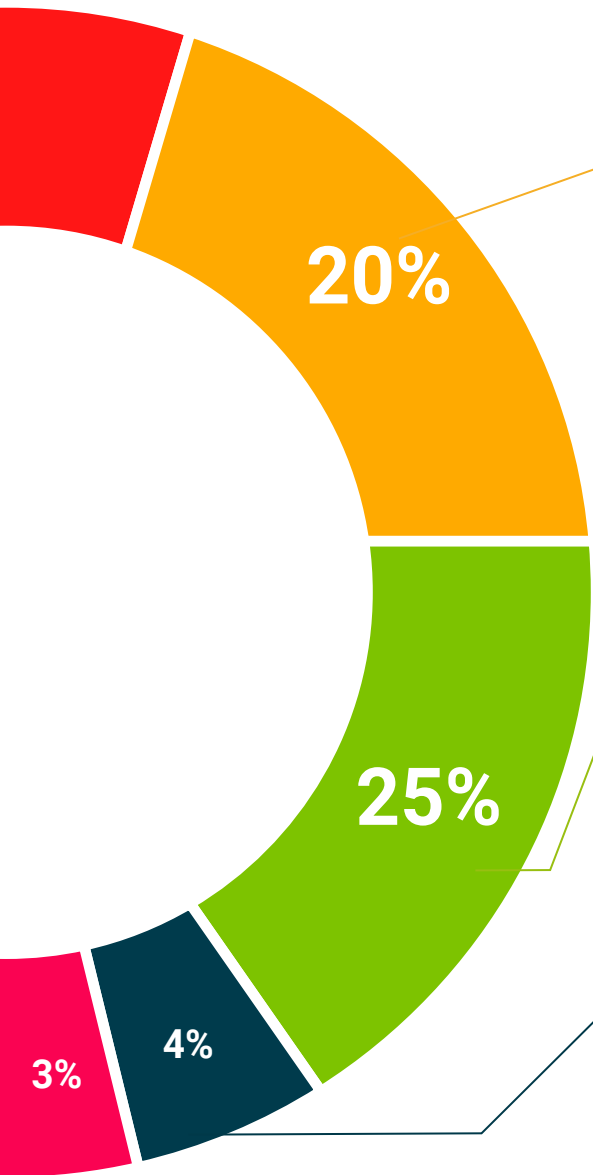
They will carry out activities to develop specific skills and abilities in each subject area. Exercises and activities to acquire and develop the skills and abilities that a specialist needs to develop in the context of the globalization that we are experiencing.



### Additional Reading

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





#### Case Studies

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



#### Interactive Summaries

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

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



#### Testing & Retesting

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



# 06 Certificate

The Postgraduate Diploma in Blockchain Development guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Diploma issued by TECH Technological University.





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

This **Postgraduate Diploma in Blockchain Development** contains the most complete and up-to-date program on the market.

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

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

Title: **Postgraduate Diploma in Blockchain Development**

Official N° of Hours: **450 h.**



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

future  
health confidence people  
education information tutors  
guarantee accreditation teaching  
institutions technology learning  
community commitment  
personalized service innovation  
knowledge present quality  
development languages  
virtual classroom



## Postgraduate Diploma Blockchain Development

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

# Postgraduate Diploma Blockchain Development

```
group_info->small_block) {  
    != group_info->small_block) {  
        group_info->nblocks; i++)  
        page((unsigned long)groupinfo->blocks[i]);  
        i = 0; i < group_info->nblocks; i++)  
        freepage((unsigned long)groupinfo->blocks[i]);  
        kfree(groupinfo);  
    }  
    kfree(groupinfo);  
}  
false  
= True  
= modifier ob  
EXPORTSYMBOL(groupsfree);  
EXPORTSYMBOL(groupsfree);  
/* export the groupinfo to a user-space array */  
int groups_touser(qid_t_user *grouplist,  
/* export the groupinfo to a user-space array */  
const struct group_info *group_info)  
static int groups_touser(qid_t_user *grouplist,  
const struct group_info *group_info)  
int i;  
int count = groupinfo->nblocks;
```