Executive Master's Degree

Algorithmic Trading

tech global university

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Executive Master's Degree
Algorithmic Trading

- Modality: **online**
- Duration: **12 months**
- Certificate: **TECH Global University**
- Accreditation: **60 ECTS**
- Schedule: **at your own pace**
- Exams: **online**

Website: **www.techtitute.com/us/school-of-business/executive-master-degree/master-algorithmic-trading**

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01

Introduction to the Program

Algorithmic Trading has radically transformed finance, executing trades at speeds and scales beyond human intervention. In this context, according to the Association of Financial Markets in Europe (AFME), more than 75% of trades in equity markets are conducted through algorithms, highlighting the need for professionals with advanced knowledge in programming, mathematics, and financial strategy to navigate this complex ecosystem. Consequently, TECH has designed this comprehensive postgraduate program as the best option to meet these demands. Through a 100% online approach, key aspects of using computer algorithms to automate the buying and selling of financial instruments will be provided.

Thanks to this comprehensive 100% online university program, you will master Algorithmic Trading, market structure, and the programming of financial strategies"

The global financial sector is undergoing a profound digital transformation. Therefore, the increasing sophistication of markets, the abundance of data, and the need to execute trades with pinpoint precision have placed Algorithmic Trading at the heart of investment strategies. In this way, those aiming to stand out in this field must not only master the fundamentals of the market but also the technological tools that enable the automation and optimization of investment decisions. This constant dynamism demands ongoing updates and specialization to understand the risks and seize the opportunities presented by these new operational paradigms.

In light of this, where mastering technology and quantitative strategy has become essential for competitiveness in financial markets, the Algorithmic Trading program at TECH emerges. This comprehensive program is designed to provide professionals with the theoretical knowledge and practical tools necessary to understand, develop, and implement the related algorithms. In doing so, they will be prepared for the future of automated investments.

The academic path will cover fundamental topics such as a global overview of financial markets, operating instruments and structures, risks, regulation, and market microstructure and its influence. Additionally, emphasis will be placed on order types and execution, financial intermediaries, macroeconomic factors impacting the market, and the latest innovations such as Digitalization, Blockchain, Cryptocurrencies, and Asset Tokenization.

At the same time, this university program offers a 100% online methodology, providing the flexibility needed for professionals to balance their academic development with their work and personal obligations. As such, the degree content is available 24/7, accessible from any device with an internet connection. Finally, the learning process will be reinforced through the implementation of the Relearning method, which facilitates the assimilation of key concepts through repetition.

This **Executive Master's Degree in Algorithmic Trading** contains the most complete and up-to-date program on the market. The most important features include:

- The development of practical case studies presented by experts in Algorithmic Trading
- 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

You will be trained to master the automation of investments and data analysis in financial markets through this comprehensive academic path"

TECH will provide you with a cutting-edge teaching methodology, designed to help you master the complexities of programming and strategy in financial markets"

A 100% online postgraduate degree that allows you to train at any time and from anywhere, adapting to your lifestyle while specializing in Algorithmic Trading.

The vast array of academic resources will help you consolidate your theoretical knowledge in Algorithmic Trading.

The program includes teachers who are professionals in the field of Algorithmic Trading, sharing the expertise from their work, along with renowned specialists from leading firms 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"

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.

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 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

The educational resources that make up this program have been developed by a select group of experts in Financial Markets and Algorithmic Development. As a result, the syllabus will delve into the market microstructure, from order types to Market Makers, providing professionals with a deep understanding of market dynamics. Additionally, the syllabus will explore the most advanced Algorithmic strategies, including Momentum, Trend Following, Market Making, and Statistical Arbitrage. In this way, graduates will be able to design and implement robust and efficient Trading systems.

Through a comprehensive syllabus, you will learn to design cutting-edge algorithms and master Artificial Intelligence for financial decision-making, transforming the market microstructure to your advantage"

Module 1. Algorithmic Trading in Financial Markets

1.1. Global Overview of Financial Markets
- 1.1.1. Elements of a Financial System
- 1.1.2. History and Evolution of Financial Markets
- 1.1.3. Types of Financial Markets
- 1.1.4. Participants in the Markets
- 1.1.5. Trading Robots as Market Participants

1.2. Financial Instruments for Trading
- 1.2.1. Stocks, Bonds, and Derivatives
- 1.2.2. Spot and Futures Markets
- 1.2.3. ETFs and Other Investment Vehicles

1.3. Market Structure and Functioning
- 1.3.1. Trading Hours and Mechanisms
- 1.3.2. Organized and OTC Markets
- 1.3.3. Price Formation

1.4. Market Microstructure and Its Influence on Trading
- 1.4.1. Market Depth and Liquidity
- 1.4.2. Spread and Transaction Costs
- 1.4.3. Role of Market Makers

1.5. Risks in Financial Markets
- 1.5.1. Market, Credit, and Liquidity Risks
- 1.5.2. Systemic Risk
- 1.5.3. Risk Management and Hedging

1.6. Regulation and Standards
- 1.6.1. European and Global Regulations
- 1.6.2. Market Supervision
- 1.6.3. Investor Protection

1.7. Order Types and Execution
- 1.7.1. Market and Limit Orders
- 1.7.2. Stop Loss and Take Profit Orders
- 1.7.3. Trailing Stop Orders
- 1.7.4. Order Programming in Algorithmic Trading

1.8. Financial Intermediaries
- 1.8.1. Banks, Brokers, and Hedge Funds
- 1.8.2. Investment Funds and ETFs
- 1.8.3. Trading Platforms

1.9. Macroeconomic Factors in the Markets
- 1.9.1. Monetary and Fiscal Policy
- 1.9.2. Key Economic Indicators
- 1.9.3. Impact of News and Events

1.10. Innovation in Financial Markets
- 1.10.1. Digitalization and Blockchain
- 1.10.2. Cryptocurrencies and DeFi
- 1.10.3. Tokenization of Assets

Module 2. Stock Market Analysis in Algorithmic Trading

2.1. Evaluation of Stock Market Analysis in Algorithmic Trading
- 2.1.1. Technical Analysis vs. Fundamental Analysis
- 2.1.2. Market Efficiency Theory
- 2.1.3. Principles of Trading Based on Analysis

2.2. Fundamental Analysis of Companies
- 2.2.1. Economic and Financial Diagnosis
- 2.2.2. Financial Statements and Key Ratios
- 2.2.3. Company Valuation by Static Methods
- 2.2.4. External Factors Affecting Stocks

2.3. Company Valuation
- 2.3.1. Market Consensus
- 2.3.2. Valuation by Multiples
- 2.3.3. Valuation by Dividend Discount
- 2.3.4. Valuation by Discounted Cash Flow
- 2.3.5. Use of AI and Company Valuation Bots

2.4. Technical Analysis: Basic Principles for Trading
- 2.4.1. Types of Charts and Their Interpretation
- 2.4.2. Volume and Trend
- 2.4.3. Key Technical Indicators

2.5. Japanese Candlestick Patterns
  2.5.1. Individual Candles and Combinations
  2.5.2. Reversal and Continuation Patterns
  2.5.3. Applications in Trading
2.6. Advanced Technical Indicators to Implement in Algorithmic Trading
  2.6.1. RSI, MACD, and Bollinger Bands
  2.6.2. Oscillators and Moving Averages
  2.6.3. Configuration and Application
2.7. Technical Analysis Strategies to Implement in Trading
  2.7.1. Trend Trading
  2.7.2. Range Trading
  2.7.3. Trading with Volume
2.8. Intermarket Analysis and Correlations
  2.8.1. Relationship Between Financial Assets
  2.8.2. Commodities, Currencies, and Equities
  2.8.3. Hedging and Diversification
2.9. Order Flow Analysis
  2.9.1. Level 2 and Order Book
  2.9.2. Market Depth and VWAP
  2.9.3. *Tape Reading*
2.10. Limitations of Stock Market Analysis
  2.10.1. Biases and Common Mistakes
  2.10.2. Market Manipulation
  2.10.3. Real Applications and Context

Module 3. Algorithmic Trading in Psychology and Decision Making

3.1. The Importance of Psychology in Trading
  3.1.1. Emotional Impact on Decisions
  3.1.2. Common Cognitive Biases
  3.1.3. Emotional Control in Volatile Markets
3.2. Cognitive Biases in Trading
  3.2.1. Anchoring Effect and Loss Aversion
  3.2.2. Overconfidence and Excessive Trading
  3.2.3. Herd Effect and Confirmation Bias
3.3. Emotional Management in Trading
  3.3.1. Strategies to Stay Calm
  3.3.2. Resilience and Discipline
  3.3.3. Mindfulness Techniques and Stress Control
3.4. Decision Making in Uncertainty
  3.4.1. Rational vs. Emotional Analysis
  3.4.2. How to Assess Probabilities
  3.4.3. Decision-Making Methods
3.5. Developing a Professional and/or Automated Trading Mindset
  3.5.1. Planning and Discipline
  3.5.2. Learning and Continuous Improvement
  3.5.3. Psychological Preparation for Trading
3.6. Managing Psychological Risk
  3.6.1. Impact of Drawdown on the Trader
  3.6.2. Handling Consecutive Losses
  3.6.3. Avoiding Revenge Trading
  3.6.4. Is There Psychological Risk in Algorithmic Trading?
3.7. Strategies to Prevent Mental Burnout
  3.7.1. How to Avoid Burnout
  3.7.2. Importance of Breaks
  3.7.3. Disconnection Techniques
  3.7.4. Automation
3.8. Psychology of Money and Risk Aversion
  3.8.1. Relationship between Risk and Return
  3.8.2. Personal Risk Tolerance
  3.8.3. Financial Goal Assessment
3.9. Neuroscience Applied to Trading
  3.9.1. Brain Function in Decision Making
  3.9.2. Dopamine and Trading Addiction
  3.9.3. How to Train the Mind for Success
3.10. Common Psychological Errors and How to Avoid Them
  3.10.1. Lack of Patience and Overtrading
  3.10.2. Not Following the Trading Plan
  3.10.3. How to Maintain Discipline

Module 4. Fundamentals of Algorithmic Trading

4.1. Philosophy of Algorithmic Trading
- 4.1.1. Advantages of Algorithmic Trading over Manual Trading
- 4.1.2. Evolution and Adoption in the Markets
- 4.1.3. Differences with Discretionary Trading

4.2. Intraday Algorithmic Strategies
- 4.2.1. Characteristics of Intraday Investment Strategies
- 4.2.2. Advanced Study of Intraday Strategies
- 4.2.3. Profitability and Risk of These Strategies

4.3. Swing Algorithmic Strategies
- 4.3.1. Characteristics of Continuous Investment
- 4.3.2. Advanced Study of Continuous Trading Systems
- 4.3.3. Profitability and Risk of These Strategies

4.4. Architecture of an Algorithmic Trading System
- 4.4.1. Key Components
- 4.4.2. Data Flow and Execution
- 4.4.3. Integration with Market APIs

4.5. Data Sources in Algorithmic Trading
- 4.5.1. Historical and Real-Time Data
- 4.5.2. Data Quality and Cleansing
- 4.5.3. Free and Paid Sources

4.6. Latency and Speed in Algorithmic Trading
- 4.6.1. Importance of Fast Execution
- 4.6.2. Factors Affecting Latency
- 4.6.3. Co-location and High-Frequency Trading

4.7. Performance Metrics
- 4.7.1. Metrics Based on Profitability
- 4.7.2. Drawdown Analysis
- 4.7.3. Metrics Based on Hit Rate
- 4.7.4. Metrics Based on Risk Management

4.8. Backtesting and Strategy Validation
- 4.8.1. Backtesting Methods
- 4.8.2. Avoiding Overfitting
- 4.8.3. Performance Evaluation

4.9. Infrastructure and Hardware for Algorithmic Trading
- 4.9.1. Dedicated Servers vs. *Cloud Computing*
- 4.9.2. Networks and Connectivity
- 4.9.3. Security and Maintenance

4.10. Limitations and Challenges of Algorithmic Trading
- 4.10.1. Complexity and Costs
- 4.10.2. Risks of Technical Failures
- 4.10.3. Adaptability to Changing Conditions

Module 5. Typology, Logic, and Design of Algorithmic Trading Strategies

5.1. Momentum and Trend Following Strategies
- 5.1.1. Identifying Trends
- 5.1.2. Indicators and Filters
- 5.1.3. Implementation in Code

5.2. Mean Reversion Strategies
- 5.2.1. Mean Reversion Investment
- 5.2.2. Application in Different Markets
- 5.2.3. Statistical Models

5.3. Statistical Arbitrage and Pairs Trading
- 5.3.1. Identifying Correlated Pairs
- 5.3.2. Cointegration Models
- 5.3.3. Execution and Risk Management

5.4. Market Making and Liquidity Provision
- 5.4.1. How Market Makers Operate
- 5.4.2. Strategies to Capture the Spread
- 5.4.3. Risks and Optimization

5.5. Volume-Based and Order Flow Strategies
- 5.5.1. Order Flow Analysis
- 5.5.2. Impact of Volume on Price
- 5.5.3. Identifying Opportunities

5.6. Event and News-Based Strategies
- 5.6.1. Trading on Macroeconomic Events
- 5.6.2. Sentiment Analysis in News
- 5.6.3. Automation of News-Based Trading

5.7. High-Frequency Trading (HFT) Strategies
- 5.7.1. Characteristics of HFT
- 5.7.2. Ultra-Fast Execution Algorithms
- 5.7.3. Technological Requirements

5.8. Hybrid Strategies and Combinations
- 5.8.1. Integrating Multiple Strategies
- 5.8.2. Algorithmic Portfolio Management
- 5.8.3. Diversification and Risk Control

5.9. Optimization and Adaptation of Strategies
- 5.9.1. Parameter Adjustment
- 5.9.2. Machine Learning in Optimization
- 5.9.3. Adaptability to Market Changes

5.10. Ethical and Regulatory Considerations
- 5.10.1. Regulations on Algorithmic Trading
- 5.10.2. Market Manipulation Issues
- 5.10.3. Ethics in the Use of Financial Algorithms

Module 6. Quantitative Analysis and Machine Learning in Algorithmic Trading

6.1. Fundamentals of Quantitative Analysis
- 6.1.1. Key Characteristics of Quantitative Analysis
- 6.1.2. Probabilistic Models in Trading
- 6.1.3. Use of Statistics in Financial Markets

6.2. Mathematical Models Applied to Trading
- 6.2.1. Time Series Models
- 6.2.2. Regression and Correlations
- 6.2.3. Volatility Models

6.3. Machine Learning in Algorithmic Trading
- 6.3.1. Advanced Understanding of Machine Learning
- 6.3.2. Supervised Learning Algorithms
- 6.3.3. Unsupervised Learning Algorithms

6.3.4. Reinforcement Learning Algorithms
6.3.5. Benefits and Risks
6.4. Neural Networks and Deep Learning in Algorithmic Trading
6.4.1. Applications of Neural Networks
6.4.2. Price Prediction Models
6.4.3. Limitations and Challenges
6.5. Advanced Backtesting with Machine Learning
6.5.1. Evaluation of Predictive Models
6.5.2. Cross-Validation
6.5.3. Avoiding Overfitting
6.6. Optimization of Strategies with Artificial Intelligence
6.6.1. Genetic Algorithms
6.6.2. Reinforcement in Trading
6.6.3. AutoML in Finance
6.7. Risk Factors in Quantitative Models
6.7.1. Biases in Data
6.7.2. Overfitting and Noisy Data
6.7.3. Model Robustness
6.8. Implementation of ML Strategies in Real Environments
6.8.1. Deployment in Production
6.8.2. Model Monitoring
6.8.3. Adapting to Market Changes
6.9. Use of Alternative Data in Trading
6.9.1. Social Media and Market Sentiment
6.9.2. Satellite and Alternative Data
6.9.3. Other Sentiment Indicators
6.10. Ethics and Regulation in the Use of AI in Trading
6.10.1. Algorithmic Biases
6.10.2. Emerging Regulations
6.10.3. Responsibility in Decision Making

Module 7. Programming and Development of Algorithms in Trading

7.1. Fundamentals of Programming for Trading
7.1.1. Most Common Programming Languages (Python, R, etc.)
7.1.2. Development Environments and Tools
7.1.3. Version Control
7.2. Financial Data Manipulation with Python
7.2.1. Essential Libraries (Pandas, NumPy, etc.)
7.2.2. Loading and Processing Historical Data
7.2.3. Analysis and Visualization
7.3. Automation of Trading Strategies
7.3.1. Developing Scripts for Automated Execution
7.3.2. Broker APIs and Market Connections
7.3.3. Automation of Analysis and Reporting
7.4. Design of Custom Indicators
7.4.1. Creating Custom Technical Indicators
7.4.2. Combining Multiple Signals
7.4.3. Implementation in Code
7.5. Development of Trading Bots
7.5.1. Architecture of a Trading Bot
7.5.2. Order Execution and Management
7.5.3. Simulation of Trades
7.6. Testing and Debugging Algorithms
7.6.1. Identifying Common Errors
7.6.2. Debugging Tools
7.6.3. Unit Testing and Quality Control
7.7. Use of Databases in Algorithmic Trading
7.7.1. SQL vs. NoSQL in Trading
7.7.2. Efficient Storage of Historical Data
7.7.3. Query Optimization
7.8. Integration with Market Data APIs
7.8.1. APIs with Brokers and Data Feeders
7.8.2. Real-Time Data Extraction and Updates
7.8.3. Web Scraping and Alternative Data Sources

7.9. Infrastructure and Deployment of Algorithms
- 7.9.1. Local Servers vs. *Cloud Computing*
- 7.9.2. Deployment in Major Clouds (AWS, Google Cloud, Azure)
- 7.9.3. Security and Maintenance

7.10. Optimization and Scalability of Algorithms
- 7.10.1. Code Performance Improvement
- 7.10.2. Parallelization and Distributed Processing
- 7.10.3. Latency Management and Execution Times

Module 8. Implementation, Development, and Monitoring of Algorithmic Trading Strategies

8.1. From Development to Live Market Execution
- 8.1.1. Transition Process from Backtesting to Live Trading
- 8.1.2. Testing in Simulated Environments
- 8.1.3. Final Adjustments and Calibrations

8.2. Selecting a Broker and Execution Platform
- 8.2.1. Brokers for Algorithmic Trading
- 8.2.2. Differences Between ECN, STP, and Market Maker
- 8.2.3. Commissions and Hidden Costs

8.3. Implementation of Automated Execution Systems
- 8.3.1. Types of Execution (Market, Limit, Stop)
- 8.3.2. Smart Order Routing Algorithms
- 8.3.4. Impact of Slippage on Strategies

8.4. Monitoring and Adjusting Strategies
- 8.4.1. Real-Time Performance Evaluation
- 8.4.2. Algorithmic Efficiency Indicators
- 8.4.3. Adjustments on the Fly

8.5. Risk Management in Strategy Execution
- 8.5.1. Loss and Exposure Control
- 8.5.2. Dynamic Leverage Adjustment
- 8.5.3. Identifying Execution Failures

8.6. Use of Dedicated Servers for Execution
- 8.6.1. Co-location and Low Latency Servers
- 8.6.2. Hardware and Software Considerations
- 8.6.3. Costs and Benefits

8.7. Costs and Benefits
- 8.7.1. Handling Emergencies and System Failures
- 8.7.2. Contingency Plans
- 8.7.3. Automation of Alerts and Notifications

8.8. Performance Metrics Evaluation
- 8.8.1. Risk-Adjusted Profitability
- 8.8.2. Drawdowns and Volatility
- 8.8.3. Analysis of Key Metrics (Sharpe, Sortino, Calmar)

8.9. Continuous Strategy Optimization
- 8.9.1. Machine Learning in Strategy Adjustment
- 8.9.2. Periodic Review of Models
- 8.9.3. Avoiding Over-Optimization

8.10. Regulatory Aspects of Algorithmic Execution
- 8.10.1. Regulations on Automated Trading
- 8.10.2. Transparency and Audit Requirements
- 8.10.3. Compliance Standards (MiFID, SEC, ESMA)

Module 9. Risk Analysis in Algorithmic Trading

9.1. The Importance of Risk Management in Trading
- 9.1.1. Types of Risk in Financial Markets
- 9.1.2. Importance of Risk Control
- 9.1.3. Quantitative vs. Qualitative Approaches

9.2. Market Risk and Volatility
- 9.2.1. Factors Influencing Volatility
- 9.2.2. Calculation and Use of Value at Risk (VaR)
- 9.2.3. Volatility Prediction Models

9.3. Liquidity and Implementation Risk
- 9.3.1. Liquidity and Execution Risk
- 9.3.2. Impact of Liquidity on Trading
- 9.3.3. Order Book Analysis

9.4. Credit and Counterparty Risk
- 9.4.1. Importance of Counterparty Risk
- 9.4.2. Evaluating Broker Solvency
- 9.4.3. Preventing Default Risk

9.5. Operational Risk in Algorithmic Trading
- 9.5.1. Technical Failures and Execution Errors
- 9.5.2. Risks Associated with Data and Market Feeds
- 9.5.3. Mitigation Strategies

9.6. Systemic Risk and Financial Crises
- 9.6.1. Crisis Trigger Factors
- 9.6.2. Domino Effect in Markets
- 9.6.3. Hedging Strategies in Crises

9.7. Managing Drawdown and Loss Control
- 9.7.1. Evaluating Drawdowns in Strategies
- 9.7.2. Loss Reduction Techniques
- 9.7.3. Psychology of Risk and Loss Aversion

9.8. Diversification and Portfolio Management
- 9.8.1. Diversification Across Strategies and Markets
- 9.8.2. Asset Correlations
- 9.8.3. Using Portfolio Optimization Models

9.9. Risk Management Tools and Software
- 9.9.1. Specialized Platforms
- 9.9.2. Adverse Scenario Simulation
- 9.9.3. Evaluation of Key Metrics

9.10. Regulatory Framework and Compliance in Risk Management
- 9.10.1. International Risk Regulations
- 9.10.2. Regulatory Requirements for Funds and Traders
- 9.10.3. Transparency and Auditing in Risk Management

Module 10. Taxation of Algorithmic Trading

10.1. The Importance of Taxation in Trading
- 10.1.1. Tax Obligations of Traders
- 10.1.2. Differences Between the Taxation of Individuals and Companies
- 10.1.3. Tax Regime for Derivatives and Cryptocurrencies

10.2. Taxation of Gains and Losses in Trading
- 10.2.1. Tax Calculation on Profits
- 10.2.2. Loss Deductions
- 10.2.3. Differences According to Country of Residence

10.3. Taxation of Algorithmic Trading vs. Discretionary Trading
- 10.3.1. Differences in Taxation
- 10.3.2. Legal Aspects of Automated Trading
- 10.3.3. Tax Control on Financial Algorithms

10.4. Tax Havens and International Regulation
- 10.4.1. Use of Offshore Companies
- 10.4.2. International Regulations Against Tax Evasion
- 10.4.3. Legal Implications

10.5. Transparency and Auditing in Algorithmic Trading
- 10.5.1. Financial Reporting Requirements
- 10.5.2. Audits in Investment Funds
- 10.5.3. Data Protection Regulation

10.6. Sustainability in Financial Markets
- 10.6.1. ESG Investment and Sustainable Criteria
- 10.6.2. Trading Algorithms with a Positive Impact
- 10.6.3. Regulations on Sustainable Finance

10.7. Cryptocurrencies and Taxation
- 10.7.1. Taxation of Digital Assets
- 10.7.2. Emerging Regulations
- 10.7.3. Security and Regulatory Compliance

10.8. Environmental Impact of Algorithmic Trading
- 10.8.1. Energy Consumption in HFT (High-Frequency Trading)
- 10.8.2. Sustainable Alternatives
- 10.8.3. Environmental Regulations

10.9. Tax Strategies for Professional Traders
- 10.9.1. Tax Optimization
- 10.9.2. Tax Planning
- 10.9.3. Use of Legal Structures

10.10. Ethics in Algorithmic Trading and Social Responsibility
- 10.10.1. Social Impact of Financial Markets
- 10.10.2. Transparency and Governance
- 10.10.3. Ethical Standards in Algorithm Development

You will become an architect of financial systems, applying quantitative analysis and Machine Learning to optimize your investment decisions"

04

Teaching Objectives

The design of this program aims to equip financial professionals with the skills necessary for the development and implementation of Algorithmic Trading systems. Therefore, the focus will be on automating strategies and optimizing performance, including development environments such as Python and R. This will enable professionals to acquire expertise in managing financial databases and integrating with market APIs, allowing them to build robust technological infrastructures. As a result, they will enhance their ability to apply Machine Learning and Deep Learning models for price prediction, offering solutions to any challenge.

You will efficiently manage risks by applying quantitative models and Machine Learning tools to safeguard your algorithmic operations"

General Objectives

- Develop a deep understanding of financial markets and microstructure, identifying key participants, instruments, and trading mechanisms to operate with precision
- Master market analysis, applying both fundamental and advanced techniques to evaluate companies and anticipate price movements within the context of algorithmic trading
- Effectively manage trading psychology and decision-making in uncertain environments, mitigating cognitive biases and developing a professional mindset for automated operations
- Implement innovative algorithmic strategies, ranging from Momentum to Market Making, and understand their architecture, data sources, and performance metrics for optimal execution
- Apply quantitative analysis models and Machine Learning, including Neural Networks and Deep Learning, to optimize trading strategies and make market predictions
- Program and develop robust trading algorithms using languages like Python, integrating market APIs and databases to automate financial operations
- Execute and monitor algorithmic trading systems in real-time, selecting appropriate brokers and managing risks in the transition from backtesting to live markets
- Evaluate and mitigate various risks associated with algorithmic trading, including market, liquidity, credit, and operational risks, ensuring the robustness of investments
- Understand the taxation of algorithmic trading, as well as regulatory and ethical implications
- Design strategies to operate responsibly and in compliance with international regulations

Specific Objectives

Module 1. Algorithmic Trading in Financial Markets

- Analyze the global vision of financial markets, identifying their elements, historical evolution, and key participants
- Evaluate financial instruments suitable for trading, including stocks, bonds, derivatives, and ETFs, along with their operational characteristics
- Examine market microstructure, understanding depth, liquidity, spread, and the role of market makers
- Identify and apply the most relevant execution orders and program orders in algorithmic environments

Module 2. Stock Market Analysis in Algorithmic Trading

- Distinguish between technical and fundamental analysis, evaluating their application in the context of algorithmic trading
- Conduct fundamental analysis of companies, diagnosing their financial situation and applying static and dynamic valuation methods
- Interpret candlestick patterns and use advanced technical indicators to identify trading opportunities
- Develop technical and inter-market analysis strategies, understanding asset correlations and order flow analysis

Module 3. Algorithmic Trading in Psychology and Decision Making

- Recognize the emotional impact on trading decisions, identifying common cognitive biases and their influence
- Develop effective strategies for emotional management in highly volatile environments and decision-making under uncertainty
- Foster a professional trading mindset, promoting planning, discipline, and continuous improvement
- Apply neuroscience knowledge to understand brain functioning in decision-making and avoid recurring psychological errors

Module 4. Fundamentals of Algorithmic Trading

- Understand the philosophy of algorithmic trading, its advantages over manual operations, and its evolution in the markets
- Design algorithmic trading system architectures, identifying key components, data flow, and API integration
- Manage data sources for algorithmic trading efficiently, considering quality, cleaning, and latency impact
- Validate algorithmic trading strategies through backtesting, avoiding overfitting and evaluating performance with specific metrics

Module 5. Typology, Logic, and Design of Algorithmic Trading Strategies

- Implement momentum and trend-following strategies, identifying trends and incorporating appropriate indicators and filters
- Apply mean reversion and statistical arbitrage strategies, recognizing correlated pairs and cointegration models
- Develop market-making strategies and liquidity provision, operating to capture the spread and optimize performance
- Create hybrid strategies and combinations, integrating multiple approaches and adapting them to changing market conditions

Module 6. Quantitative Analysis and Machine Learning in Algorithmic Trading

- Apply mathematical and probabilistic models in trading, using time series, regression, and correlations
- Implement machine learning and deep learning algorithms in algorithmic trading, including neural networks for price prediction
- Conduct advanced backtesting with machine learning, evaluating predictive models and applying cross-validation to avoid overfitting
- Use alternative data, such as market sentiment from social media, and incorporate ethical and regulatory considerations in the use of AI in trading

Module 7. Programming and Development of Algorithms in Trading

- Master the fundamentals of programming for trading, using languages like Python and essential libraries for financial data manipulation
- Automate trading strategies by developing scripts for automatic execution and integrating with broker APIs and markets
- Design and develop custom indicators, as well as the architecture of trading bots, simulating trades with precision
- Implement and optimize algorithms in the cloud, managing infrastructure and scalability, ensuring security and maintenance

Module 8. Implementation, Development, and Monitoring of Algorithmic Trading Strategies

- Transition from development to live market execution, performing tests in simulated environments and final calibrations
- Select appropriate brokers and execution platforms for algorithmic trading, understanding different types and costs
- Implement automated execution systems, managing order types, smart order routing, and slippage impact
- Continuously monitor and adjust strategies in real time, evaluating performance metrics and handling emergencies or system failures

Module 9. Risk Analysis in Algorithmic Trading

- Evaluate the different types of risks in financial markets, including market risk, volatility, liquidity, and execution
- Calculate and apply Value at Risk (VaR), volatility prediction models, and order book analysis for risk management
- Manage drawdowns and control losses, applying reduction techniques and understanding risk psychology
- Design diversification strategies and portfolio management, using optimization models and specialized tools for adverse scenarios

Module 10. Taxation of Algorithmic Trading

- Understand the tax obligations of traders, distinguishing between individual and company taxation, and the tax regime for derivatives and cryptocurrencies
- Calculate the taxation of gains and losses in trading, considering deductions and differences based on country of residence
- Analyze the fiscal and legal implications of algorithmic trading versus discretionary trading, and fiscal control over financial algorithms
- Identify tax strategies for professionals, evaluating transparency, auditing, and compliance with international regulations and ethics

05

Career Opportunities

This university program represents a significant opportunity for professionals in the financial sector looking to update their skills and master advanced tools in Algorithmic Trading. Through cutting-edge knowledge in market microstructure analysis, automated risk management, and the application of Machine Learning to financial data, graduates will significantly expand their career horizons. Additionally, the demand for professionals capable of developing, implementing, and monitoring quantitative investment systems is growing, allowing graduates to aim for highly specialized roles in a continuously evolving and automating market.

You will advance your career in Finance and master the creation, execution, and analysis of Algorithmic Trading strategies, opening a wide range of opportunities in high-tech trading"

Graduate Profile

Graduates of this program will be able to apply the principles and techniques of Algorithmic Trading to optimize investment decisions. They will also master strategy programming, market microstructure analysis, and advanced risk management. Furthermore, they will be capable of interpreting complex financial data, implementing automated execution systems, and handling the dynamic nature of global markets. This expertise will contribute to the development of innovative solutions in the financial sector.

You will handle strategy programming, market analysis, and risk management to lead the future of Algorithmic Trading.

- **Design and Optimization of Algorithmic Strategies:** Conceptualize, program, and implement algorithmic trading strategies, as well as analyze and optimize their performance across various financial markets
- **Quantitative Analysis and Market Microstructure:** Interpret large volumes of financial data, apply statistical and Machine Learning models, and understand market microstructure to identify investment opportunities
- **Ethical Commitment and Risk Management:** Apply ethical principles and regulatory frameworks in the development and execution of trading algorithms, ensuring transparency and effective mitigation of financial and operational risks
- **Interdisciplinary Collaboration:** Work effectively with finance professionals, programmers, data analysts, and other specialists, facilitating the development and implementation of algorithmic trading systems

After completing this university program, you will be able to apply your knowledge and skills in the following positions:

1. ***Quant Trader / Quantitative Analyst:*** Responsible for designing, building, and evaluating mathematical and statistical models to identify investment opportunities and optimize trading strategies.
2. **Trading Algorithm Developer:** Responsible for programming and maintaining automated systems that execute trades in financial markets.
3. **Algorithmic Portfolio Manager:** Leads the management and optimization of investment portfolios using automated trading strategies and models.
4. **Financial Data Analyst:** Responsible for collecting, cleaning, processing, and interpreting large volumes of market data to identify patterns and trends relevant to trading.
5. **Machine Learning Expert for Finance:** Manages the application of artificial intelligence algorithms and machine learning to predict market movements and improve strategy performance.
6. **Trading Operator in Hedge Funds or Financial Institutions:** Responsible for real-time supervision and adjustment of trading algorithms in high-demand environments, ensuring proper functionality.
7. **Software Developer in Fintechs or Financial Startups:** In charge of creating innovative technological solutions for trading infrastructure, investment platforms, and financial analysis tools.
8. **Researcher in Quantitative Finance and Algorithmic Trading:** Leads research projects and the development of new theories and methodologies for algorithmic trading, contributing to the advancement of knowledge in the sector.

06

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.

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.

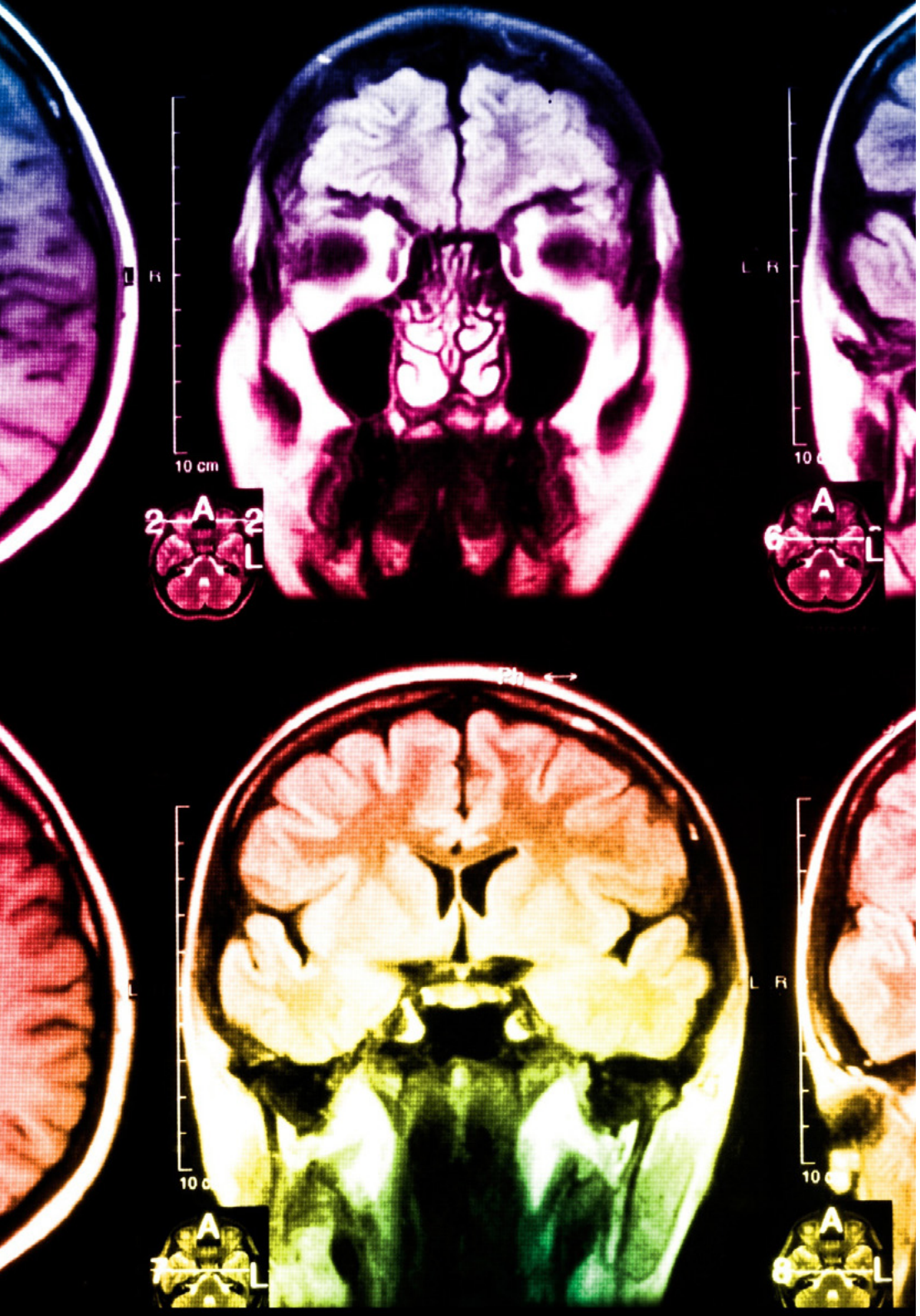
In order to facilitate tutor-student contact as much as possible, you will have a wide range of communication possibilities, both in real time and delayed (internal messaging, telephone answering service, email contact with the technical secretary, chat and videoconferences).

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.

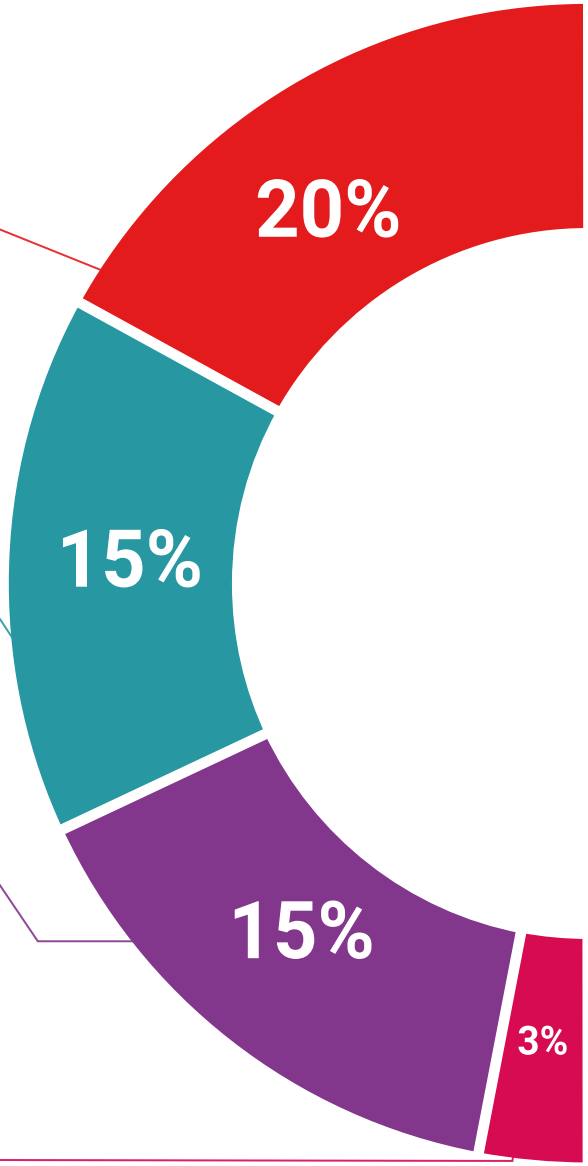
Interactive Summaries

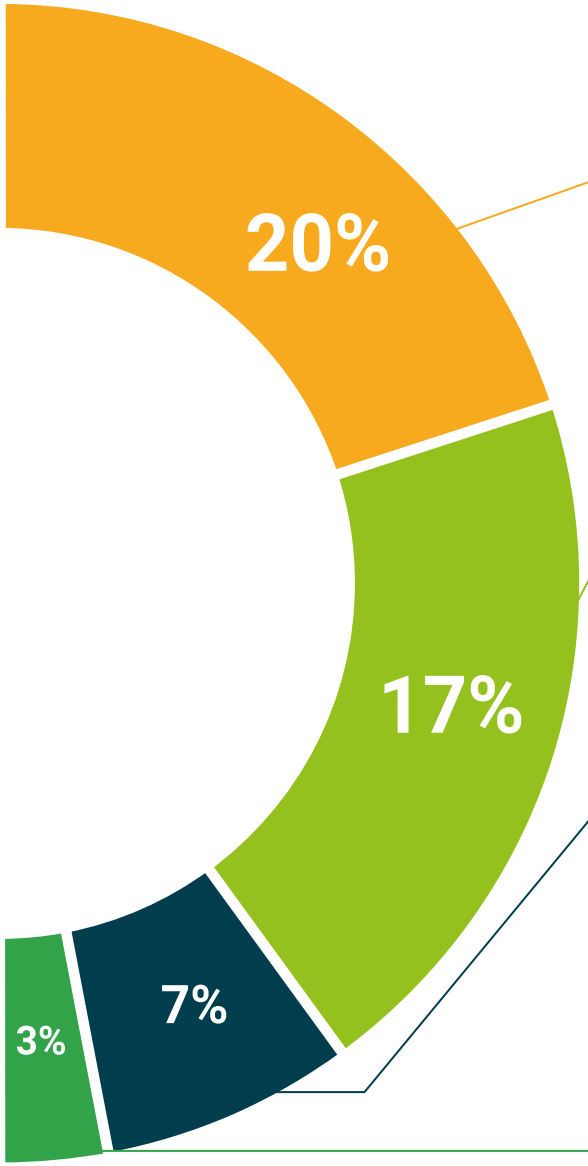
We present the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

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.





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.

07

Teaching Staff

The teaching team of this innovative university program has been carefully selected for their solid track record in Algorithmic Trading and financial markets. As a result, these professionals not only possess deep academic knowledge, but also have extensive practical experience in implementing quantitative strategies, analyzing financial Big Data, and managing real-time risks. Therefore, their expertise in using programming tools and Machine Learning will ensure that students receive training based on the latest trends and best practices in the industry.

This exceptional faculty, composed of leaders and experts in Algorithmic Trading and quantitative finance, will guide you with their real-world experience and forward-looking vision in the global markets"

Management

Dr. Gómez Martínez, Raúl

- Founding Partner and CEO of Open 4 Blockchain Fintech
- Founding Partner of *InvestMood Fintech*
- Apara's CEO
- PhD in Business Economics and Finance from the University Rey Juan Carlos de Madrid
- Bachelor's Degree in Economics and Business Administration, Complutense University of Madrid
- Master's Degree in Economic Analysis and Financial Economics, Complutense University of Madrid

Dr. Lara Bocanegra, Ana María

- Company Owner (Financial)
- Ph.D. from the University of Seville
- Trader of NYSE Stocks at World Trade Securities
- Junior Trader at Swiftrad
- Mechanical Behaviour of Materials from University of Seville
- Experimental Techniques II from University of Seville
- Materials Science from University of Seville
- Advanced Trading Stocks Techniques from University of Seville

Teachers

Dr. Medrano García, María Luisa

- Director of university graduate programs
- Technical advisor for public institutions
- Professor in university degrees, courses and postgraduate programs.
- Ph.D. in Senior Management from the Rey Juan Carlos University
- Degree in Business Administration from the Complutense University of Madrid
- Economic and Social Council of the Community of Madrid Research Award

Dr. Guerra Moruno, Lucía

- Responsible for content planning and technical strategies at Scientia System S.L.U
- Ph.D. in Big Data and Quantitative Finance
- Head of Content Creation and Programming Strategies at Scientia System S.L
- Technical Consultant and Programmer at Incubadora de Traders S.L.U
- Master's Degree in Banking and Quantitative Finance
- Graduate in Physics

Mr. Martín Moreno, David

- Specialist in Financial Management by European University Miguel de Cervantes Business School
- Master's Degree in Financial Planning and Advice, Rey Juan Carlos University
- Bachelor's Degree in Accounting and Finance from Rey Juan Carlos University

Mr. Segura Pacho, Felipe Marcelo

- Back Office at Indra BPO Services SLU
- Accountant at JC Segura Construcciones SA
- Specialist in Corporate Finance at the Catholic University of Salta
- Master's Degree in Financial Planning and Advice, Rey Juan Carlos University
- Master's Degree in Business Management from the Public University of Navarra
- Collaborator of the project *"Trading in Stock Exchange and Financial Markets"*

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

08

Certificate

This Executive Master's Degree in Algorithmic Trading guarantees students, in addition to the most rigorous and up-to-date education, access to a diploma for the Executive Master's Degree 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 **Executive Master's Degree in Algorithmic Trading** 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: **Executive Master's Degree in Algorithmic Trading**

Modality: **online**

Duration: **12 months**

Accreditation: **60 ECTS**

tech global university

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

Executive Master's Degree in Algorithmic Trading

This is a private qualification of 1,800 hours of duration equivalent to 60 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

Executive Master's Degree in Algorithmic Trading

General Structure of the Syllabus

Subject type	ECTS
Compulsory (CO)	60
Optional (OP)	0
External Work Placement (WP)	0
Master's Degree Thesis (MDT)	0
	Total 60

General Structure of the Syllabus

Year	Subject	ECTS	Type
1º	Algorithmic Trading in Financial Markets	6	CO
1º	Stock Market Analysis in Algorithmic Trading	6	CO
1º	Algorithmic Trading in Psychology and Decision Making	6	CO
1º	Fundamentals of Algorithmic Trading	6	CO
1º	Typology, Logic, and Design of Algorithmic Trading Strategies	6	CO
1º	Quantitative Analysis and Machine Learning in Algorithmic Trading	6	CO
1º	Programming and Development of Algorithms in Trading	6	CO
1º	Implementation, Development, and Monitoring of Algorithmic Trading Strategies	6	CO
1º	Risk Analysis in Algorithmic Trading	6	CO
1º	Taxation of Algorithmic Trading	6	CO

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Dean

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*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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Executive Master's Degree

Algorithmic Trading

- Modality: **online**
- Duration: **12 months**
- Certificate: **TECH Global University**
- Accreditation: **60 ECTS**
- Schedule: **at your own pace**
- Exams: **online**

Executive Master's Degree
Algorithmic Trading

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