

# Executive Master's Degree Financial Mathematics

**M F M**



## Executive Master's Degree Financial Mathematics

- » Modality: online
- » Duration: 12 months
- » Certificate: TECH Technological University
- » Dedication: 16h/week
- » Schedule: at your own pace
- » Exams: online
- » Target Group: University Graduates who have previously completed any of the degrees in the fields of Business Mathematics, Business Administration and Management.

Website: [www.techtitute.com/us/school-of-business/professional-master-degree/master-financial-mathematics](http://www.techtitute.com/us/school-of-business/professional-master-degree/master-financial-mathematics)

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# 01

# Welcome

Financial education is a fundamental tool for the economic development of citizens, from the most basic to the most complex actions. Understanding the paradigm and financial functioning is essential in daily management, such as the calculation of income and expenses in a household or interest rates, but it is also of interest when carrying out economic policy evaluations of a country's government. For this reason, TECH offers a complete and focused program in Financial Mathematics for managers graduated in accounting or economics to develop their business and management skills. This will be done through the study of techniques and methods of mathematics within the financial framework of the company, as well as microeconomics and macroeconomics, in addition to the influence of economics on social policy. A specific and rigorous program that applies the latest pedagogical technology so that, in a 100% online format, it can be adapted to the needs of specialists.



Executive Master's Degree in Financial Mathematics.  
TECH Technological University



“

*Update your knowledge in financial strategies so that you can keep up with the demands of the business market and project your professional career"*

02

# Why Study at TECH?

TECH is the world's largest 100% online business school. It is an elite business school, with a model based on the highest academic standards. A world-class centre for intensive managerial skills training.



“

*TECH is a university at the forefront of technology, and puts all its resources at the student's disposal to help them achieve entrepreneurial success"*

## At TECH Technological University



### Innovation

The university offers an online learning model that combines the latest educational technology with the most rigorous teaching methods. A unique method with the highest international recognition that will provide students with the keys to develop in a rapidly-evolving world, where innovation must be every entrepreneur's focus.

"Microsoft Europe Success Story", for integrating the innovative, interactive multi-video system.



### The Highest Standards

Admissions criteria at TECH are not economic. Students don't need to make a large investment to study at this university. However, in order to obtain a qualification from TECH, the student's intelligence and ability will be tested to their limits. The institution's academic standards are exceptionally high...

**95%** | of TECH students successfully complete their studies



### Networking

Professionals from countries all over the world attend TECH, allowing students to establish a large network of contacts that may prove useful to them in the future.

**100,000+**  
executives trained each year

**200+**  
different nationalities



### Empowerment

Students will grow hand in hand with the best companies and highly regarded and influential professionals. TECH has developed strategic partnerships and a valuable network of contacts with major economic players in 7 continents.

**500+** | collaborative agreements with leading companies



### Talent

This program is a unique initiative to allow students to showcase their talent in the business world. An opportunity that will allow them to voice their concerns and share their business vision.

After completing this program, TECH helps students show the world their talent.



### Multicultural Context

While studying at TECH, students will enjoy a unique experience. Study in a multicultural context. In a program with a global vision, through which students can learn about the operating methods in different parts of the world, and gather the latest information that best adapts to their business idea.

TECH students represent more than 200 different nationalities.





TECH strives for excellence and, to this end, boasts a series of characteristics that make this university unique:



### Learn with the best

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In the classroom, TECH's teaching staff discuss how they have achieved success in their companies, working in a real, lively, and dynamic context. Teachers who are fully committed to offering a quality specialization that will allow students to advance in their career and stand out in the business world.

Teachers representing 20 different nationalities.



*At TECH you will have access to Harvard Business School case studies"*



### Analysis

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TECH explores the student's critical side, their ability to question things, their problem-solving skills, as well as their interpersonal skills.



### Academic Excellence

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TECH offers students the best online learning methodology. The university combines the Relearning methodology (the most internationally recognized postgraduate learning methodology) with Harvard Business School case studies. A complex balance of traditional and state-of-the-art methods, within the most demanding academic framework.



### Economy of Scale

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TECH is the world's largest online university. It currently boasts a portfolio of more than 10,000 university postgraduate programs. And in today's new economy, **volume + technology = a groundbreaking price**. This way, TECH ensures that studying is not as expensive for students as it would be at another university.

03

# Why Our Program?

Studying this TECH program means increasing the chances of achieving professional success in senior business management.

It is a challenge that demands effort and dedication, but it opens the door to a promising future. Students will learn from the best teaching staff and with the most flexible and innovative educational methodology.



“

*We have highly qualified teachers and the most complete syllabus on the market, which allows us to offer you training of the highest academic level"*

This program will provide students with a multitude of professional and personal advantages, particularly the following:

**01**

### A significant career boost

By studying at TECH, students will be able to take control of their future and develop their full potential. By completing this program, students will acquire the skills required to make a positive change in their career in a short period of time.

*70% of participants achieve positive career development in less than 2 years.*

**02**

### Develop a strategic and global vision of companies

TECH offers an in-depth overview of general management to understand how each decision affects each of the company's different functional areas.

*Our global vision of companies will improve your strategic vision.*

**03**

### Consolidate the student's senior management skills

Studying at TECH means opening the doors to a wide range of professional opportunities for students to position themselves as senior executives, with a broad vision of the international environment.

*You will work on more than 100 real senior management cases.*

**04**

### Take on new responsibilities

The program will cover the latest trends, advances and strategies, so that students can carry out their professional work in a changing environment.

*45% of graduates are promoted internally.*

05

### Access to a powerful network of contacts

TECH connects its students to maximize opportunities. Students with the same concerns and desire to grow. Therefore, partnerships, customers or suppliers can be shared.

*You will find a network of contacts that will be instrumental for professional development.*

06

### Thoroughly develop business projects

Students will acquire a deep strategic vision that will help them develop their own project, taking into account the different areas in companies.

*20% of our students develop their own business idea.*

07

### Improve soft skills and management skills

TECH helps students apply and develop the knowledge they have acquired, while improving their interpersonal skills in order to become leaders who make a difference.

*Improve your communication and leadership skills and enhance your career.*

08

### Be part of an exclusive community

Students will be part of a community of elite executives, large companies, renowned institutions, and qualified professors from the most prestigious universities in the world: the TECH Technological University community.

*We give you the opportunity to train with a team of world renowned teachers.*

# 04 Objectives

This program is a rigorous program to broaden and update the knowledge of managers with high business aspirations. In this sense, TECH has called upon experts versed in the sector to transmit knowledge in macroeconomics, financial operations, statistics and econometrics, among other issues. In this way, the program offers the possibility to develop your financial skills through a contemporary economic perspective.



“

*Join a program that will address economics not only from a theoretical point of view, but will also include real exercises to help you master the highest stock market prices"*

TECH makes the goals of their students their own goals too.  
Working together to achieve them.

The Executive Master's Degree in Financial Mathematics will enable the student to:

01

Understand the fundamentals of supply, demand and market preferences

04

Identify the basic variables of microeconomics, such as: public intervention, externalities and public goods, static and dynamic game theory, etc.

02

Know the basic elements that make up business mathematics: linear and matrix algebra, matrices, matrix transposition, calculus, matrix inversion, systems of equations, etc.

|               |                |
|---------------|----------------|
| \$335,000.00  | \$435,000.00   |
| (\$35,000.00) | (\$135,000.00) |
| 0%            |                |
| Segment Name  | Segment Name   |

03

Understand the different techniques and mathematical methods used within the financial framework of a company

05

Recognize economic realities in one or more differential equations from an economic perspective



06

Recognize the basic concepts of statistics and probability

08

Identify the monetary economy and the exchange rate regime

|                |              |      |
|----------------|--------------|------|
|                | \$140,000.00 | \$4  |
|                | \$650,000.00 | \$1, |
|                | \$350,000.00 | \$   |
| 0%             | 100%         |      |
| [Segment Name] |              |      |

09

Understand the effects of fixed and flexible exchange rates and their effects on macroeconomic indicators in an open economic environment

07

Identify the functioning of the economy in a globalization scenario to take advantage of the productive fabric and improve it

10

Analyze economic theories by means of estimation methods, calculations or by interval and hypothesis testing, both parametric and non-parametric

# 05 Skills

To perform an adequate work in the field of Financial Mathematics, it is essential to adopt a critical view of national and international economic problems, to develop tools and strategies based on positive results that are effective, as well as to act avidly in the framework of the financial enterprise. This is why, throughout this program, managers will not only find a useful reference guide to evaluate the possible consequences of alternative economic actions, but will also develop skills to make future predictions regarding a country's economy.





“

*You will acquire the necessary skills to stand out as an expert manager mastering the principles of microeconomics and macroeconomics in depth”*

01

Adopt a critical view of national and international economic problems

02

Develop models such as valuation of constant, variable or fractional income within the framework of the financial enterprise

03

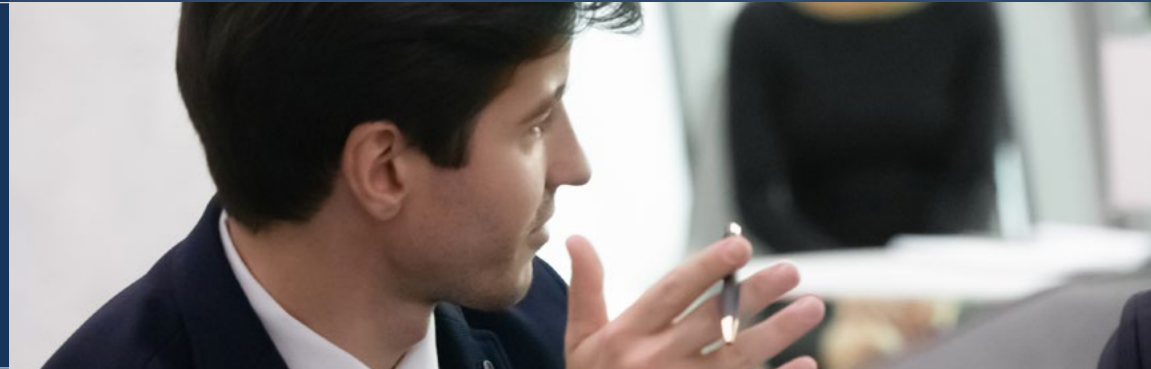
Apply mathematical techniques and methods to the financial framework of the company

04

Interpret the results of optimization problems

05

Evaluate the possible consequences of alternative actions



06

Design and select samples by identifying the means, techniques and tools to record information

08

Apply the different methods of data selection, pooling and presentation



09

Conduct economic policy assessments of a country's government

07

Integrate the effects of microeconomic variables within the business environment

10

Make predictions about a country's economy

06

# Structure and Content

The Executive Master's Degree in Financial Mathematics offers entrepreneurs who aspire to a broad career path an easy way to obtain all the latest strategic tools and financial techniques. In addition, TECH applies a 100% online modality, which allows the adaptation of the study pace, in addition to the Relearning methodology, which exempts students from long hours of memorization, assimilating the syllabus in a gradual and practical way.



“

*Contemplate the real financial scenario and establish alternative strategies thanks to the analysis of national and international issues offered by TECH”*

## Syllabus

TECH's Executive Master's Degree in Financial Mathematics is a comprehensive program designed for graduates in Economics and Business Management to meet the business challenges of the economic paradigm. A unique opportunity to delve into the financial field in the most direct and simple way.

The syllabus of this program is focused on expanding the strategic and technical skills of senior managers, so that they can optimize their professional projection and master the latest changes, their consequences and macroeconomic indicators in an open economic environment.

Throughout 1,500 hours of training, students analyze a multitude of theoretical-practical cases through individual and teamwork. It is, therefore, an authentic immersion in real business situations.

A program based on the Relearning methodology to bring the latest trends through the best educational methodology and an exceptional faculty, which will provide the students with the skills to solve critical situations in a creative and efficient way.

In addition, TECH has experts in the sector who are aware of all business opportunities to ensure that enrolled students acquire superior skills in the economic and financial field. All this, through a 100% online format that offers the possibility of adapting the study to the personal and professional needs of both those specialists who are already working in the sector, as well as those who are not yet part of it.

This Executive Master's Degree takes place over 12 months and is divided into 10 modules:

**Module 1.** Introduction to Economics

**Module 2.** Mathematics

**Module 3.** Mathematics for Economists

**Module 4.** Microeconomics

**Module 5.** Statistics I

**Module 6.** Statistics II

**Module 7.** Macroeconomics I

**Module 8.** Macroeconomics II

**Module 9.** Financial Transactions

**Module 10.** Econometrics





### Where, When and How is it Taught?

TECH offers the possibility of completing this Executive Master's Degree in Financial Mathematics entirely online. Throughout the 12 months of the educational program, you will be able to access all the contents of this program at any time, allowing you to self-manage your study time.

*A unique, key, and decisive educational experience to boost your professional development and make the definitive leap.*

**Module 1. Introduction to Economics**

|   |  |  |   |
|---|--|--|---|
| <p><b>1.1. Introduction to Supply, Demand, Equilibrium and Market Changes</b></p> <p>1.1.1. Economics: Principles and Definitions<br/> 1.1.1.1. Economic Principles and Concepts<br/> 1.1.1.2. Micro and Macro Economics<br/> 1.1.1.3. Resource Scarcity<br/> 1.1.1.4. Basic Economic Models</p>  | <p>1.1.2. Opportunity Cost<br/> 1.1.2.1. Analysis<br/> 1.1.2.2. Net Present Value</p> <p>1.1.3. The Break-even Point<br/> 1.1.3.1. Concept<br/> 1.1.3.2. Type of Costs<br/> 1.1.3.3. Calculation and Results</p>   | <p><b>1.2. Demand, Supply and Market Preferences</b></p> <p>1.2.1. Markets and Market Types<br/> 1.2.1.1. The Concept of Market<br/> 1.2.1.2. Types of Markets<br/> 1.2.1.3. The Nature of Products</p> <p>1.2.2. Market Demand<br/> 1.2.2.1. Definition and Conceptualization<br/> 1.2.2.2. Determinants of Demand</p>  | <p>1.2.3. Market Supply<br/> 1.2.3.1. Definition and Conceptualization<br/> 1.2.3.2. Determination of Supply<br/> 1.2.3.3. The Influence of Competition</p> <p>1.2.4. Equilibrium and Statics<br/> 1.2.4.1. Comparative Statics<br/> 1.2.4.2. Uses of Comparative Statics<br/> 1.2.4.3. Economic Equilibrium<br/> 1.2.4.4. Dynamic Balance</p>  |
| <p><b>1.3. The Budget Constraint and the Consumer's Equilibrium</b></p> <p>1.3.1. Budget Constraints and Travel<br/> 1.3.1.1. Concept<br/> 1.3.1.2. Slope of the Equilibrium Line<br/> 1.3.1.3. Movements on the Equilibrium Line</p> <p>1.3.2. Optimal Choice<br/> 1.3.2.1. Concept<br/> 1.3.2.2. Indifference Curve<br/> 1.3.2.3. Utility Function</p> <p>1.3.3. Optimal Choice<br/> 1.3.3.1. Concept<br/> 1.3.3.2. Indifference Curve<br/> 1.3.3.3. Utility Function</p> | <p><b>1.4. Consumer and Producer Surplus. The Efficiency of Competitive Equilibrium</b></p> <p>1.4.1. Consumer and Producer Surplus<br/> 1.4.1.1. Law of Diminishing Returns<br/> 1.4.1.2. Supply and Demand Curve<br/> 1.4.1.3. Increasing and Decreasing Marginal Utility</p> <p>1.4.2. The Efficiency of Competitive Equilibrium<br/> 1.4.2.1. Concept<br/> 1.4.2.2. The Mathematical Conditions of Short-Run Equilibrium<br/> 1.4.2.3. The Mathematical Conditions of Long-Run Competitive Equilibrium</p> | <p><b>1.5. Price Ceilings and Floors, the Effect of an Indirect Tax</b></p> <p>1.5.1. Price Ceilings and Floors<br/> 1.5.1.1. Conceptualization<br/> 1.5.1.2. Maximum Price<br/> 1.5.1.3. Minimum Price</p> <p>1.5.2. Effect of an Indirect Tax<br/> 1.5.2.1. Definition and Major Concepts<br/> 1.5.2.2. Legal and Economic Impact<br/> 1.5.2.3. Economic Impact Analysis</p> | <p><b>1.6. Price Elasticity of Demand and Elasticity Determinant Factors</b></p> <p>1.6.1. Price Elasticity of Demand<br/> 1.6.1.1. Concepts<br/> 1.6.1.2. Factors that Determine Price Elasticity of Demand<br/> 1.6.1.3. Total Income and Elasticity</p> <p>1.6.2. Summary of Elasticity Types<br/> 1.6.2.1. Perfectly or Infinitely Elastic<br/> 1.6.2.2. Perfectly or Infinitely Inelastic<br/> 1.6.2.3. Greater and Less Than 1<br/> 1.6.2.4. Equal to 0</p> |
| <p><b>1.7. Elasticity of Cross-Demand and its Analytical Calculation</b></p> <p>1.7.1. Cross Elasticity<br/> 1.7.1.1. Context<br/> 1.7.1.2. Concepts and Definitions<br/> 1.7.1.3. Substitute Goods and Independent Goods</p> <p>1.7.2. Analytical Calculation<br/> 1.7.2.1. Formula<br/> 1.7.2.2. Calculations and Examples</p>  | <p><b>1.8. The Production Function and Yields</b></p> <p>1.8.1. Production Function<br/> 1.8.1.1. Basic Assumptions<br/> 1.8.1.2. Total Production<br/> 1.8.1.3. Average Production<br/> 1.8.1.4. Marginal Production</p> <p>1.8.2. Law of Diminishing Returns<br/> 1.8.2.1. Concept<br/> 1.8.2.2. Graph and Interpretations<br/> 1.8.2.3. Returns to Scale</p>  | <p><b>1.9. Short-Term and Long-Term Costs</b></p> <p>1.9.1. Cost Functions<br/> 1.9.1.1. Definitions and Concepts<br/> 1.9.1.2. Company Costs<br/> 1.9.1.3. Formulation and Representations</p> <p>1.9.2. Short-Term Costs<br/> 1.9.2.1. Concept and Definitions<br/> 1.9.2.2. Types of Short-Term Costs<br/> 1.9.2.3. Formulation</p>   | <p>1.9.3. Long-Term Costs<br/> 1.9.3.1. Concept and Definitions<br/> 1.9.3.2. Types of Long-Term Costs<br/> 1.9.3.3. Formulation</p>  |

**1.10. Basic Economic Data**

- 1.10.1. Economic Activity
  - 1.10.1.1. Conceptualization
  - 1.10.1.2. Economic Growth
  - 1.10.1.3. The Public Sector
  - 1.10.1.4. General Objectives
- 1.10.2. Price Indexes and Market Indicators
  - 1.10.2.1. Conceptualization
  - 1.10.2.2. Simple and Complex Indexes
  - 1.10.2.3. Nominal GDP
  - 1.10.2.4. Real GDP
- 1.10.3. Circular Income Flow
  - 1.10.3.1. Conceptualization
  - 1.10.3.2. Types of Flow: Real and Monetary
  - 1.10.3.3. Public Sector Intervention

**1.11. Monetary Policies**

- 1.11.1. Money and its Circulation
  - 1.11.1.1. Concept and Objectives
  - 1.11.1.2. The Demand for Money
  - 1.11.1.3. Money Circulation
- 1.11.2. Equilibrium in the Money Market and Monetary Policy
  - 1.11.2.1. Market Equilibrium
  - 1.11.2.2. Open Market Operations
  - 1.11.2.3. Conventional and Unconventional Monetary Policy

**1.12. Structures and Market Types**

- 1.12.1. Market Structures
  - 1.12.1.1. The Concept of Market
  - 1.12.1.2. Perfect and Imperfect Competition
  - 1.12.1.3. Monopoly
  - 1.12.1.4. Oligopolies and Duopolies
  - 1.12.1.5. Monopsonies
  - 1.12.1.6. Oligopsony

**1.13. Non-Competitive Markets**

- 1.13.1. Monopolistic Market Competition
  - 1.13.1.1. The Concept of Monopoly
  - 1.13.1.2. The Social Cost of Monopolies
  - 1.13.1.3. Price Discrimination
- 1.13.2. Oligopoly Market Competition
  - 1.13.2.1. The Concept of Oligopoly
  - 1.13.2.2. Different Types of Oligopolies

**1.14. Aggregate Demand and Supply Model**

- 1.14.1. Aggregate Demand
  - 1.14.1.1. Concept
  - 1.14.1.2. Calculation Basis
  - 1.14.1.3. Aggregate Demand Curve
- 1.14.2. The Keynesian Multiplier
  - 1.14.2.1. Concept
  - 1.14.2.2. The Effects Caused by the Multiplier
  - 1.14.2.3. Calculation Basis
- 1.14.3. Aggregate Supply
  - 1.14.3.1. Concept
  - 1.14.3.2. Factors
  - 1.14.3.3. Variations

**1.15. International Economic Relations**

- 1.15.1. International Trade
  - 1.15.1.1. Basic Concepts
  - 1.15.1.2. Exchange Rate and Terms of Trade
  - 1.15.1.3. Trade Policy Instruments
- 1.15.2. Balance of Payments and Exchange Rate Theories
  - 1.15.2.1. Balance of Payments
  - 1.15.2.2. Exchange Rate Theories

Module 2. Mathematics

**2.1. Basic Elements of Linear and Matrix Algebra**

- 2.1.1. The Vector Space of  $\mathbb{R}^n$ , Functions and Variables
  - 2.1.1.1. Graphical Representation of Sets of  $\mathbb{R}$
  - 2.1.1.2. Basic Concepts of Functions of Several Real Variables. Operations with Functions
  - 2.1.1.3. Function Types
  - 2.1.1.4. Weirstrass' Theorem

2.1.2. Optimization with Inequality Constraints

- 2.1.2.1. Two-Variable Graphical Method
- 2.1.3. Function Types
  - 2.1.3.1. Separate Variables
  - 2.1.3.2. Polynomial Variables
  - 2.1.3.3. Rational Variables
  - 2.1.3.4. Quadratic Forms

**2.2. Matrices: Types, Concepts and Operations**

- 2.2.1. Basic Definitions
  - 2.2.1.1. Matrix of Order  $m \times n$
  - 2.2.1.2. Square Matrices
  - 2.2.1.3. Identity Matrix
- 2.2.2. Matrix Operations
  - 2.2.2.1. Matrix Addition
  - 2.2.2.2. Scalar Multiplication
  - 2.2.2.3. Matrix Multiplication

**2.3. Transpose**

- 2.3.1. Diagonalizable Matrix
- 2.3.2. Transpose Properties
  - 2.3.2.1. Involution

**2.4. Determinants: Calculation and Definition**

- 2.4.1. The Concept of Determinants
  - 2.4.1.1. Determinant Definition
  - 2.4.1.2. Square Matrix of Order 2,3 and Greater Than 3
- 2.4.2. Triangular Matrices
  - 2.4.2.1. Determinant of Triangular Matrices
  - 2.4.2.2. Determinant of Non-Triangular Square Matrices
- 2.4.3. Properties of Determinants
  - 2.4.3.1. Simplifying Calculations
  - 2.4.3.2. Calculation in any Case

**2.5. Invertible Matrices**

- 2.5.1. Properties of Invertible Matrices
  - 2.5.1.1. The Concept of Inversion
  - 2.5.1.2. Definitions and Basic Concepts
- 2.5.2. Invertible Matrix Calculation
  - 2.5.2.1. Methods and Calculation
  - 2.5.2.2. Exceptions and Examples
- 2.5.3. Expression Matrices and Matrix Equations
  - 2.5.3.1. Expression Matrices
  - 2.5.3.2. Matrix Equations

**2.6. Solving Systems of Equations**

- 2.6.1. Linear Equations
  - 2.6.1.1. Discussion of the System. Rouché–Capelli Theorem
  - 2.6.1.2. Cramer's Rule: Solving the System
  - 2.6.1.3. Homogeneous Systems
- 2.6.2. Vector Spaces
  - 2.6.2.1. Properties of Vector Spaces
  - 2.6.2.2. Linear Combination of Vectors
  - 2.6.2.3. Linear Dependence and Independence
  - 2.6.2.4. Coordinate Vectors
  - 2.6.2.5. The Basis Theorem

**2.7. Quadratic Forms**

- 2.7.1. Concept and Definition of Quadratic Forms
- 2.7.2. Quadratic Matrices
  - 2.7.2.1. Law of Inertia for Quadratic Forms
  - 2.7.2.2. Study of the Sign by Eigenvalues
  - 2.7.2.3. Study of the Sign by Minors

**2.8. Functions of One Variable**

- 2.8.1. Analysis of the Behavior of a Magnitude
  - 2.8.1.1. Local Analysis
  - 2.8.1.2. Continuity
  - 2.8.1.3. Restricted Continuity

**2.9. Limits of Functions, Domain and Image in Real Functions**

- 2.9.1. Multi-variable Functions
  - 2.9.1.1. Vector of Several Variables
- 2.9.2. The Domain of a Function
  - 2.9.2.1. Concept and Applications
- 2.9.3. Function Limits
  - 2.9.3.1. Limits of a Function at a Point
  - 2.9.3.2. Lateral Limits of a Function
  - 2.9.3.3. Limits of Rational Functions

2.9.4. Indeterminacy

- 2.9.4.1. Indeterminacy in Functions with Roots
- 2.9.4.2. Indetermination  $0/0$
- 2.9.5. The Domain and Image of a Function
  - 2.9.5.1. Concept and Characteristics
  - 2.9.5.2. Domain and Image Calculation

## 2.10. Derivatives: Behavior Analysis

- 2.10.1. Derivatives of a Function at a Point
  - 2.10.1.1. Concept and Characteristics
  - 2.10.1.2. Geometric Interpretation
- 2.10.2. Differentiation Rules
  - 2.10.2.1. Derivative of a Constant
  - 2.10.2.2. Derivative of a Sum or Differentiation
  - 2.10.2.3. Derivative of a Product
  - 2.10.2.4. Derivative of an Opposite Function
  - 2.10.2.5. Derivative of a Compound's Function

## 2.11. Application of Derivatives to Study Functions

- 2.11.1. Properties of Differentiable Functions
  - 2.11.1.1. Maximum Theorem
  - 2.11.1.2. Minimum Theorem
  - 2.11.1.3. Rolle's Theorem
  - 2.11.1.4. Mean Value Theorem
  - 2.11.1.5. L'Hôpital's Rule
- 2.11.2. Valuation of Economic Quantities
- 2.11.3. Differentiable Functions

## 2.12. Function Optimization for Several Variables

- 2.12.1. Function Optimization
  - 2.12.1.1. Optimization with Equality Constraint
  - 2.12.1.2. Critical Points
  - 2.12.1.3. Relative Extremes
- 2.12.2. Convex and Concave Functions
  - 2.12.2.1. Properties of Convex and Concave Functions
  - 2.12.2.2. Inflection Points
  - 2.12.2.3. Growth and Decay

## 2.13. Indefinite Integrals

- 2.13.1. Antiderivatives
  - 2.13.1.1. Basic Concepts
  - 2.13.1.2. Calculation Methods
- 2.13.2. Immediate Integrals
  - 2.13.2.1. Properties of Immediate Integrals
- 2.13.3. Integration Methods
  - 2.13.3.1. Rational Integrals

## 2.14. Definite Integrals

- 2.14.1. Barrow's Fundamental Theorem
  - 2.14.1.1. Definition of the Theorem
  - 2.14.1.2. Calculation Basis
  - 2.14.1.3. Applications of the Theorem
- 2.14.2. Curve Cutoff in Definite Integrals
  - 2.14.2.1. Concept of Curve Cutoff
  - 2.14.2.2. Calculation Basis and Operations Study
  - 2.14.2.3. Applications of Curve Cutoff Calculation

- 2.14.3. Mean Value Theorem
  - 2.14.3.1. Concept and Closed Interval Theorem
  - 2.14.3.2. Calculation Basis and Operations Study
  - 2.14.3.3. Applications of the Theorem

**Module 3. Mathematics for Economists**

|   |   |   |  |
|---|---|---|--|
| <p><b>3.1. Multi-Variable Functions</b></p> <p>3.1.1. Terminology and Basic Mathematical Concepts</p> <p>3.1.2. Definition of IRn in IRm Functions</p> <p>3.1.3. Graphic Representation</p> <p>3.1.4. Types of Functions</p> <p>3.1.4.1. Scaled Functions</p> <p>3.1.4.1.1. Concave Function and Its Application to Economic Research</p> <p>3.1.4.1.2. Convex Function and Its Application to Economic Research</p> <p>3.1.4.1.3. Level Curves</p> <p>3.1.4.2. Vectorial Functions</p> <p>3.1.4.3. Operations with Functions</p> | <p><b>3.2. Multi-variable Real Functions</b></p> <p>3.2.1. Function Limits</p> <p>3.2.1.1. Point Limit of an IRn in IRm Function</p> <p>3.2.1.2. Directional Limits</p> <p>3.2.1.3. Double Limits and Their Properties</p> <p>3.2.1.4. Limit of an IRn in IRm Function</p> <p>3.2.2. Continuity Study of Multi-variable Functions</p> <p>3.2.3. Function Derivatives: Successive and Partial Derivatives Concept of Differential of a Function</p> <p>3.2.4. Differentiation of Compound Functions: Chain Rule</p> <p>3.2.5. Homogeneous Functions</p> <p>3.2.5.1. Properties</p> <p>3.2.5.2. Euler's Theorem and Its Economic Interpretation</p> | <p><b>3.3. Optimization</b></p> <p>3.3.1. Definition</p> <p>3.3.2. Searching and Interpreting Optimum</p> <p>3.3.3. Weirstrass' Theorem</p> <p>3.3.4. Local-Global Theorem</p>  | <p><b>3.4. Unconstrained and Constrained Equality Optimization</b></p> <p>3.4.1. Taylor's Theorem Applied to Multi-variable Functions</p> <p>3.4.2. Unconstrained Optimization</p> <p>3.4.3. Constrained Optimization</p> <p>3.4.3.1. Direct Method</p> <p>3.4.3.2. Interpreting Lagrange Multipliers</p> <p>3.4.3.2.1. Hessian Matrix</p> |
| <p><b>3.5. Optimization with Inequality Constraints</b></p> <p>3.5.1. Introduction</p> <p>3.5.2. Necessary First-order Conditions for the Existence of Local Optima: Kuhn-Tucker's Theorem and Its Economic Interpretation</p> <p>3.5.3. Globality Theorem: Convex Programming</p>  | <p><b>3.6. Lineal Programming</b></p> <p>3.6.1. Introduction</p> <p>3.6.2. Properties</p> <p>3.6.3. Graphic Resolution</p> <p>3.6.4. Applying Kuhn-Tucker Conditions</p> <p>3.6.5. Simplex Method</p> <p>3.6.6. Economic Applications</p>   | <p><b>3.7. Integral Calculus: Riemann's Integral</b></p> <p>3.7.1. Definition and Application in Economics</p> <p>3.7.2. Properties</p> <p>3.7.3. Integrability Conditions</p> <p>3.7.4. Relation between Integrals and Derivatives</p> <p>3.7.5. Integration by Parts</p> <p>3.7.6. Change of Variables Integration Method</p> | <p><b>3.8. Applications of Riemann's Integral in Business and Economics</b></p> <p>3.8.1. Distribution Function</p> <p>3.8.2. Present Value of a Cash Flow</p> <p>3.8.3. Mean Value of a Function in an Enclosure</p> <p>3.8.4. Pierre-Simon Laplace and His Contribution</p>  |
| <p><b>3.9. Ordinary Differential Equations</b></p> <p>3.9.1. Introduction</p> <p>3.9.2. Definition</p> <p>3.9.3. Classification</p> <p>3.9.4. First Order Differential Equations</p> <p>3.9.4.1. Resolution</p> <p>3.9.4.2. Bernoulli's Differential Equations</p> <p>3.9.5. Exact Differential Equations</p> <p>3.9.5.1. Resolution</p> <p>3.9.6. Greater Than One Ordinary Differential Equations (with Constant Coefficients)</p>  | <p><b>3.10. Finite Difference Equations</b></p> <p>3.10.1. Introduction</p> <p>3.10.2. Discrete Variable Functions or Discrete Functions</p> <p>3.10.3. First-order Linear Finite Difference Equations with Constant Coefficients</p> <p>3.10.4. Order Linear Finite Difference Equations with Constant Coefficients</p> <p>3.10.5. Economic Applications</p>   |   |  |

**Module 4. Microeconomics**
**4.1. Microeconomics: Welfare and Typology of Market Failures**

- 4.1.1. Microeconomics
  - 4.1.1.1. Microeconomics Principles and Concepts
  - 4.1.1.2. Production
  - 4.1.1.3. Consumer Sovereignty
  - 4.1.1.4. Economic Agents
- 4.1.2. Welfare and Typology of Failures
  - 4.1.2.1. Concept of Welfare
  - 4.1.2.2. Net Present Value
  - 4.1.2.3. Types of Failures and Market Constraints

**4.2. Public Intervention. Externalities and Public Goods**

- 4.2.1. Public Intervention
  - 4.2.1.1. The Existence of Public Goods
  - 4.2.1.2. State Intervention
- 4.2.2. Externalities
  - 4.2.2.1. Internal Costs
  - 4.2.2.2. External Costs or Negative Externality
  - 4.2.2.3. External Benefits
  - 4.2.2.4. Environmental Policy

**4.3. Simultaneous Games: Normal Representation, Rationality and Information**

- 4.3.1. Simultaneous Games
  - 4.3.1.1. Concept
  - 4.3.1.2. Representation
  - 4.3.1.3. Applications
- 4.3.2. Types of Simultaneous Games
  - 4.3.2.1. Symmetrical and Asymmetrical Simultaneous Games
  - 4.3.2.2. Other Types
  - 4.3.2.3. History of Game Theory

**4.4. Dynamic Games: Extensive Representation, Perfect and Imperfect Information**

- 4.4.1. Extensive Form Representation
  - 4.4.1.1. From Extensive to Normal Form: Strategy
- 4.4.2. Backward Introduction and Sub-Game Perfect Nash Equilibrium
  - 4.4.2.1. Sequential Rationality and Nash Equilibrium
  - 4.4.2.2. Backward Introduction Procedure
  - 4.4.2.3. Sub-Games with Perfect Information
- 4.4.3. Stackelberg's Duopoly Model
  - 4.4.3.1. Concept
  - 4.4.3.2. Applications

**4.5. Oligopoly Characteristics and Models**

- 4.5.1. Oligopoly Characteristics
  - 4.5.1.1. Conceptualization
  - 4.5.1.2. Difference between Oligopoly and Monopoly
  - 4.5.1.3. Business Interdependence
- 4.5.2. Oligopoly Models
  - 4.5.2.1. Differentiated
  - 4.5.2.2. Concentrated
  - 4.5.2.3. Duopolies
- 4.5.3. Barriers to Market Entry
  - 4.5.3.1. Oligopoly Practices
  - 4.5.3.2. Causes and Consequences

**4.6. The Public Sector and Oligopolies**

- 4.6.1. Different Models
  - 4.6.1.1. Cournot's Model
  - 4.6.1.2. Stackelberg Competition Model
- 4.6.2. The Public Sector
  - 4.6.2.1. Public Sectors and Innovation
  - 4.6.2.2. Sector Failures
  - 4.6.2.3. Oligopolies Worldwide

**4.7. Monopolistic Competition**

- 4.7.1. The Concept of Monopoly
  - 4.7.1.1. Context
  - 4.7.1.2. Concepts and Definitions
- 4.7.2. Characteristics of Markets
  - 4.7.2.1. Examples of Markets
  - 4.7.2.2. Imperfect Competition

**4.8. Differentiation, Equilibrium and Comparison between Perfect and Monopolistic Competition**

- 4.8.1. Differentiation
  - 4.8.1.1. Concepts
  - 4.8.1.2. Features
  - 4.8.1.3. Highlights
- 4.8.2. Balance
  - 4.8.2.1. Concept
  - 4.8.2.2. Marginal Cost
  - 4.8.2.3. Producers
- 4.8.3. Comparison

**4.9. Consumer Theory**

- 4.9.1. Preferences
  - 4.9.1.1. Consumer Choice Theory
  - 4.9.1.2. Basket of Goods
  - 4.9.1.3. Preferences and Restrictions
  - 4.9.1.4. Binary Relation

**4.9.2. Indifference Curve**

- 4.9.2.1. Concept and Definitions
- 4.9.2.2. Curve Maps
- 4.9.3. Utility Function
  - 4.9.3.1. Concept and Definitions
  - 4.9.3.2. U-Level Functions
  - 4.9.3.3. Formulation and Types of Axioms

**4.10. Individual Demand Curves**

- 4.10.1. Individual Demand
  - 4.10.1.1. Conceptualization
  - 4.10.1.2. Examples
- 4.10.2. Demand Curves
  - 4.10.2.1. Conceptualization
  - 4.10.2.2. Determinants of Demand
  - 4.10.2.3. Change in the Amount of Demand
  - 4.10.2.4. Change in Demand

**4.11. Intertemporal Choice**

- 4.11.1. Intertemporal Preferences
  - 4.11.1.1. Marginal Rate of Time Preference (MRTP)
  - 4.11.1.2. Decreasing MRTP
  - 4.11.1.3. Current Period and Uncertainty
- 4.11.2. Interest Rate and Discounted Value
  - 4.11.2.1. Real Interest Rate
  - 4.11.2.2. Present Value
  - 4.11.2.3. Budget Constraint

**4.12. Social Choice under Uncertainty and Risk**

- 4.12.1. Risk Description
  - 4.12.1.1. Analysis of Decisions
  - 4.12.1.2. Expected Value
  - 4.12.1.3. Fair Play
  - 4.12.1.4. Variability
  - 4.12.1.5. Deviations

- 4.12.2. Risk Preferences
  - 4.12.2.1. Expected Utility
  - 4.12.2.2. Risk-Averse Individuals
  - 4.12.2.3. Risk-Neutral Individuals
  - 4.12.2.4. Risk-Loving Individuals
  - 4.12.2.5. Risk Premium and Value of Certainty
- 4.12.3. Risk Reduction
  - 4.12.3.1. Diversification
  - 4.12.3.2. Actuarial Justice
  - 4.12.3.3. Reservation Price

**4.13. Asymmetric Information**

- 4.13.1. Asymmetric Information
  - 4.13.1.1. Adverse Selection
  - 4.13.1.2. Moral Hazard
  - 4.13.1.3. Asymmetric Information Theory

**Module 5. Statistics I**

**5.1. Introduction to Statistics**

- 5.1.1. Basic Concepts
- 5.1.2. Types of Variables
- 5.1.3. Statistical Information

**5.2. Data Record Sorting and Classifying**

- 5.2.1. Description of Variables
- 5.2.2. Frequency Distribution Table
- 5.2.3. Quantitative and Qualitative Frequency Distribution Tables

**5.3. ICT Applications and Practical Systems**

- 5.3.1. Basic Concepts
- 5.3.2. Data Science
- 5.3.3. Data Representation

**5.4. Summary Statistics I**

- 5.4.1. Descriptive Statistics
- 5.4.2. Centralization Measurements
- 5.4.3. Measures of Dispersion
- 5.4.4. Measures of Shape and Position

**5.5. Summary Statistics II**

- 5.5.1. Box Plots
- 5.5.2. Identifying Outliers
- 5.5.3. Transformation

**5.6. Statistical Analysis of the Relationship between the Two Variables**

- 5.6.1. Tabulation
- 5.6.2. Contingency Tables and Graphical Representations
- 5.6.3. Linear Relationship between Quantitative Variables

**5.7. Time Series and Index Numbers**

- 5.7.1. Time Series
- 5.7.2. Rates of Change
- 5.7.3. Index Numbers
- 5.7.4. Consumer Prices Index (CPI) and Deflated Time Series

**5.8. Introduction to Probability: Calculation and Basic Concepts**

- 5.8.1. Basic Concepts
- 5.8.2. Set Theory
- 5.8.3. Probability Calculation

**5.9. Random Variables and Probability Distributions**

- 5.9.1. Random Variables
- 5.9.2. Variable Measurements
- 5.9.3. Function of Probability

**5.10. Probability Models for Random Variables**

- 5.10.1. Probability Calculation
- 5.10.2. Discrete Random Variables
- 5.10.3. Continuous Random Variables
- 5.10.4. Models Derived from Normal Distribution



**Module 6. Statistics II**
**6.1. Probability: Random Variables**

- 6.1.1. Random Experiments
- 6.1.2. Axioms of Probability
- 6.1.3. Elementary Properties

**6.2. Probability Models**

- 6.2.1. Random Variables
- 6.2.2. Bernoulli's Distribution
- 6.2.3. Binomial Distribution
- 6.2.4. Multinomial Distribution

**6.3. Calculating Probabilities and Critical Points with R**

- 6.3.1. Normal or Gaussian Distribution
- 6.3.2. R Commander
- 6.3.3. Properties

**6.4. Statistical Inference: Some Preliminary Concepts**

- 6.4.1. Definition and Preliminary Concepts
- 6.4.2. Binomial Distribution and Calculation
- 6.4.3. Normal Curve and Calculation

**6.5. Point Estimators: Sampling Distributions and Properties**

- 6.5.1. General Concepts of Sampling Distribution
- 6.5.2. Point Estimation
- 6.5.3. Interval Estimation

**6.6. Confidence Intervals (CI): Mean, Proportion, Variance. CI in Two Populations**

- 6.6.1. Intervals for One or Several Samples
- 6.6.2. The *Bootstrap* Method
- 6.6.3. Bayesian Intervals

**6.7. Hypothesis Testing in Statistical Inference Methods**

- 6.7.1. Statistical Hypothesis Testing
- 6.7.2. Region of Rejection and Acceptance
- 6.7.3. Decision Rules

**6.8. Particular Cases: Population Mean, Variance and Proportion. Parametric Contrasts**

- 6.8.1. Known and Unknown Variances
- 6.8.2. Likelihood Ratio
- 6.8.3. Equality Test

**6.9. Chi-Squared Goodness-of-Fit Test**

- 6.9.1. Data Grouping
- 6.9.2. Critical Region
- 6.9.3. Expected Frequency

**6.10. Normality Assumption Test: Jarque-Bera Test**

- 6.10.1. Significant Variables
- 6.10.2. Central Limit Theorem
- 6.10.3. Estimators, Histogram

**6.11. Hypothesis of Independence with Two Qualitative Variables**

- 6.11.1. Concept of Independent Variables
- 6.11.2. Observed and Expected Frequencies
- 6.11.3. Calculating the Contrast Ratio

**6.12. Simple Linear Regression Models and Point Estimation**

- 6.12.1. Regression and Linear Correlation Coefficient
- 6.12.2. Parameter Inference
- 6.12.3. Model Assumptions

**6.13. Confidence Interval and Regression Lines**

- 6.13.1. Linear Functions and Regression
- 6.13.2. Simple Linear Regression
- 6.13.3. Exogenous and Endogenous Variables

**6.14. Predictions and Applications of Information and Communication Technology**

- 6.14.1. Theoretical and Conceptual Framework
- 6.14.2. Collection and Analysis Techniques
- 6.14.3. General and Specific Objectives

**6.15. Multiple Regression Models and Point Estimation**

- 6.15.1. Hypothesis and Estimation
- 6.15.2. Types of Error and Model Adjustments
- 6.15.3. Linear Model Extensions

**6.16. Global Significance Test of Regression**

- 6.16.1. ANOVA Table
- 6.16.2. Multicollinearity

Module 7. Macroeconomics I

**7.1. From Microeconomics to Macroeconomics. The Objectives of Macroeconomics**

- 7.1.1. Differences between Microeconomics
  - 7.1.1.1. Concept and Analysis
  - 7.1.1.2. Fundamental Processes
  - 7.1.1.3. Comparative Analysis
- 7.1.2. Macroeconomic Objectives
  - 7.1.2.1. Objectives
  - 7.1.2.2. Objective Evolution

**7.2. Economic Policy Instruments**

- 7.2.1. Concept
  - 7.2.1.1. Description
  - 7.2.1.2. Evolution
- 7.2.2. Instruments
  - 7.2.2.1. Institutions
  - 7.2.2.2. Globalization
  - 7.2.2.3. Detailed Analysis
- 7.2.3. International Instruments
  - 7.2.3.1. Concepts and Definition
  - 7.2.3.2. International Management

**7.3. Aggregate Production**

- 7.3.1. Aggregate Production Theory
  - 7.3.1.1. Concepts
  - 7.3.1.2. Origin of Theory
  - 7.3.1.3. Applications
- 7.3.2. Aggregate Production Function
  - 7.3.2.1. Yields and Constants
  - 7.3.2.2. Production Factors
- 7.3.3. Applications

**7.4. Unemployment and Inflation Measurement**

- 7.4.1. Unemployment Measurement
  - 7.4.1.1. Concept and Definitions
  - 7.4.1.2. Unemployment Impacts
  - 7.4.1.3. Measurement and Instruments
- 7.4.2. Inflation
  - 7.4.2.1. Demand-Pull Inflation
  - 7.4.2.2. Cost-Push Inflation
  - 7.4.2.3. Structural Inflation

**7.5. The Demand for Goods: Consumption, Investment and Public Spending**

- 7.5.1. General Concepts
  - 7.5.1.1. Important Definitions
  - 7.5.1.2. The Consumer Market and Total Demand of Goods
- 7.5.2. The Components of GDP
  - 7.5.2.1. Consumption
  - 7.5.2.2. Investments
  - 7.5.2.3. Public Spending

**7.6. Determination of Equilibrium Production**

- 7.6.1. Concepts
  - 7.6.1.1. Definition and Characteristics
  - 7.6.1.2. Differences between Savings and Investment
- 7.6.2. Profitability
  - 7.6.2.1. Profitability Ratio
  - 7.6.2.2. Stocks, Bonds and Mutual Funds
  - 7.6.2.3. Introduction to Liquidity

**7.7. Money, Demand, Banking Systems and Money Supply**

- 7.7.1. Money
  - 7.7.1.1. Functions
  - 7.7.1.2. History & Evolution
  - 7.7.1.3. Legal Tender
- 7.7.2. Money Creation Process
  - 7.7.2.1. Money Supply
  - 7.7.2.2. Liquid Assets

**7.8. Money Market Equilibrium: Determination of the Interest Rate**

- 7.8.1. Monetary Base
  - 7.8.1.1. Money Creation
  - 7.8.1.2. Money Destruction
- 7.8.2. Central Banks
  - 7.8.2.1. Types of Rediscount
  - 7.8.2.2. Open Market Operations
  - 7.8.2.3. Monetary Policy
- 7.8.3. Market Equilibrium
  - 7.8.3.1. The Keynesian and Neoclassical Schools of Thought
  - 7.8.3.2. LM (Liquidity-Money) Curve
  - 7.8.3.3. Curve Displacements

**7.9. The Goods Market and the IS (Investment-Savings) Relationship, Financial Markets and the LM (Liquidity-Money) Relationship, the IS-LM Model**

- 7.9.1. The Goods Market and the IS Relationship
  - 7.9.1.1. Concepts and Definitions
  - 7.9.1.2. Basic Model
  - 7.9.1.3. Sales Level and Interest Rate
- 7.9.2. Financial Market and the LM Relationship
  - 7.9.2.1. Determination of Interest Rate
  - 7.9.2.2. The LM Relationship and LM Curve
  - 7.9.2.3. IS-LM Set Analysis

**7.10. Fiscal Policy and Monetary Policy**

- 7.10.1. Fiscal Policies
  - 7.10.1.1. Restrictive Fiscal Policy
  - 7.10.1.2. Expansive Policies
  - 7.10.1.3. IS Curve Conditions
- 7.10.2. Monetary Policies
  - 7.10.2.1. Restrictive and Expansive Policies
  - 7.10.2.2. LM Curve Conditions

**7.11. The Goods Market Opening: Exports, Imports and Exchange Rates**

- 7.11.1. Situation and Outlook
  - 7.11.1.1. Definition and Concepts
  - 7.11.1.2. Outlook Update
- 7.11.2. Tools and Means
  - 7.11.2.1. Analysis Types and Structure
  - 7.11.2.2. Growth Indicators
  - 7.11.2.3. IMF Interventions

**7.12. Financial Market Opening: Balance of Payments, the Relationship between Interest Rate and Exchange Rate**

- 7.12.1. Balance of Payments
  - 7.12.1.1. Balance of Capital
  - 7.12.1.2. Balance of Trade and Services
- 7.12.2. Type of Change
  - 7.12.2.1. Supply and Demand of Foreign Currencies
  - 7.12.2.2. Exchange Rate Regimes
- 7.12.3. Sterilization Policies
  - 7.12.3.1. International Monetary Market
  - 7.12.3.2. Covered Interest Rate Parity

**7.13. Equilibrium in Goods Market, Financial Markets and Aggregates in an Open Economy**

- 7.13.1. IS Curve
  - 7.13.1.1. Part of the Economic Analysis
  - 7.13.1.2. Balance
- 7.13.2. LM Curve
  - 7.13.2.1. Part of the Economic Analysis
  - 7.13.2.2. Balance

**7.14. Changes in Domestic and Foreign Demand**

- 7.14.1. Components
  - 7.14.1.1. Definitions
  - 7.14.1.2. Types of Demand
  - 7.14.1.3. Compensation Measures
- 7.14.2. Macro-Compensation Components

**7.15. The Effects of Fiscal Policy in an Open Economy**

- 7.15.1. Open Economy Models
  - 7.15.1.1. Export
  - 7.15.1.2. Import
  - 7.15.1.3. Demand for Financial Assets
- 7.15.2. Foreign Exchange and Goods Market
  - 7.15.2.1. Definitions
  - 7.15.2.2. Global Effects in Economics

**Module 8. Macroeconomics II**

**8.1. Introduction to Global Trade Models**

- 8.1.1. Analysis of International Trade and How it Works
- 8.1.2. International Trade Instruments
- 8.1.3. Integration of Countries in the International Trade Process

**8.2. The Ricardian Model. Productivity and Comparative Advantage**

- 8.2.1. Comparative Advantage
- 8.2.2. Factors of Production and their Relationship with Productivity
- 8.2.3. Experiences of the Application of Comparative Advantage in International Trade Policies

**8.3. Model of Specific Factors and Income Distribution**

- 8.3.1. International Trade in the Specific Factors Model
- 8.3.2. Rationale and Forms of Distribution of Income and Profit from Trade
- 8.3.3. Trends of the Labor Factor in Globalization

**8.4. Standard Model of an Economy Open to the World. Shifts in the OR and DR curves**

- 8.4.1. System of Tariffs and Export Subsidies as the Main Actions of the State in the Stabilization of International Trade
- 8.4.2. Effects of the OR and DR curves
- 8.4.3. International Financing

**8.5. Commercial Policy Instruments**

- 8.5.1. Analysis of the Application of Tariffs
- 8.5.2. Trade Policy Objectives
- 8.5.3. Trade Barriers in Countries and Protectionism

**8.6. Globalization and Controversies in Trade Policy**

- 8.6.1. Effects of Active Trade Policy
- 8.6.2. Consequences of Globalization on the Distribution of Per Capita Income and on the Environment
- 8.6.3. Control Agencies and Economic Agreements between Countries

**8.7. National Accounting and the Balance of Payments in an Open Economy**

- 8.7.1. National Accounts
- 8.7.2. Main Macroeconomic Aggregates
- 8.7.3. Balance of Payments

**8.8. Exchange Rates and Foreign Exchange Markets. An Asset Market Point of View**

- 8.8.1. Exchange Rates and International Transactions
- 8.8.2. The Foreign Exchange Market
- 8.8.3. The Virtual Currency Market

**8.9. Money, Interest Rates and Exchange Rates. Money Supply and Inflation**

- 8.9.1. Definition of Currency and Money
- 8.9.2. Demand and Supply of Money
- 8.9.3. Interest Rates
- 8.9.4. Type of Change
- 8.9.5. Inflation, Deflation and Other Effects on the Change in the Value of Money

**8.10. Lights and Shadows of the International Capital Market**

- 8.10.1. Principles and Contemporary Relevance of Globalization
- 8.10.2. Implications of Globalization on the International and National Financial System
- 8.10.3. Regulation of the International Financial System
  - 8.10.3.1. Globalization vs. Globalization

**Module 9. Financial Transactions**
**9.1. Basic Concepts**

- 9.1.1. Essential Terms for Financial Transactions
  - 9.1.1.1. Financial Capital
  - 9.1.1.2. Financial Law
  - 9.1.1.3. Financial Operation
  - 9.1.1.4. Commercial Characteristics: Effective Amounts and APR

**9.2. Simple Laws**

- 9.2.1. Capitalization, Simple Discounting, Equivalent Quantities and Capital Substitution
- 9.2.2. Simple Capitalization in Arrears
- 9.2.3. Simple Discounting in Arrears
- 9.2.4. Simple Discounting in Advance
- 9.2.5. Equivalent Amounts
- 9.2.6. Capital Substitution: Common Maturity and Average Maturity

**9.3. Short-Term Operations**

- 9.3.1. Discounts on Trade Bills of Exchange: *For-Fait* and Re-Draft
  - 9.3.1.1. For-Fait
  - 9.3.1.2. Re-Draft
- 9.3.2. Debit and Credit Current Account Settlements
  - 9.3.2.1. Current Debit Account
  - 9.3.2.2. Current Credit Account
- 9.3.3. Treasury Bill Transactions
  - 9.3.3.1. Concept
  - 9.3.3.2. Operation

**9.4. Compound Laws**

- 9.4.1. Capitalization and Compound Discounts
  - 9.4.1.1. Capitalization
    - 9.4.1.1.1. Concept
    - 9.4.1.1.2. Operation
  - 9.4.1.2. Compound Discounts
    - 9.4.1.2.1. Concept
    - 9.4.1.2.2. Operation

**9.5. Income Valuation. Steady Income**

- 9.5.1. Types of Steady Income
  - 9.5.1.1. Concept
- 9.5.2. Steady Income: Temporary Post-payable
  - 9.5.2.1. Concept
  - 9.5.2.2. Operation
- 9.5.3. Steady Income: Temporary - Prepayable
  - 9.5.3.1. Concept
  - 9.5.3.2. Operation
- 9.5.4. Steady Income: Temporary - Deferred
  - 9.5.4.1. Concept
  - 9.5.4.2. Operation
- 9.5.5. Steady income: Temporary - Anticipated
  - 9.5.5.1. Concept
  - 9.5.5.2. Operation
- 9.5.6. Steady Income: Perpetual
  - 9.5.6.1. Concept
  - 9.5.6.2. Operation

**9.6. Income Valuation. Variable Income**

- 9.6.1. Variable Income in Geometric Progression
  - 9.6.1.1. Temporal
    - 9.6.1.1.1. Concept
    - 9.6.1.1.2. Operation
  - 9.6.1.2. Perpetual
    - 9.6.1.2.1. Concept
    - 9.6.1.2.2. Operation
- 9.6.2. Variable Income in Arithmetic Progression
  - 9.6.2.1. Temporal
    - 9.6.2.1.1. Concept
    - 9.6.2.1.2. Operation
  - 9.6.2.2. Perpetual
    - 9.6.2.2.1. Concept
    - 9.6.2.2.2. Operation

**9.7. Income Valuation. Fractional Income**

- 9.7.1. Fractional Steady Income
  - 9.7.1.1. Concept
  - 9.7.1.2. Operation
- 9.7.2. Fractional Geometric Progression Equities
  - 9.7.2.1. Concept
  - 9.7.2.2. Operation
- 9.7.3. Variable Income in Fractional Arithmetic Progression
  - 9.7.3.1. Concept
  - 9.7.3.2. Operation
- 9.7.4. Fractional Perpetual Income
  - 9.7.4.1. Concept
  - 9.7.4.2. Operation
- 9.7.5. Non-Uniform Fractional Income
  - 9.7.5.1. Concept
  - 9.7.5.2. Operation

**9.8. Loans**

- 9.8.1. American System
  - 9.8.1.1. Concept
  - 9.8.1.2. Operation
- 9.8.2. French System
  - 9.8.2.1. Concept
  - 9.8.2.2. Operation
- 9.8.3. Variable Rate Loan and Constant Amortization Installments
  - 9.8.3.1. Concept
  - 9.8.3.2. Operation

**Module 10. Econometrics**

**10.1. The Ordinary Least Squares (OLS) Method**

- 10.1.1. Linear Regression Models
- 10.1.2. Types of Content
- 10.1.3. General Line and OLS Estimation

**10.2. OLS Method in Other Scenarios**

- 10.2.1. Abandoning Basic Assumptions
- 10.2.2. Method Behavior
- 10.2.3. Effect of Measurement Changes

**10.3. Properties of OLS Estimators**

- 10.3.1. Moments and Properties
- 10.3.2. Variance Estimation
- 10.3.3. Matrix Forms

**10.4. OLS Variance Calculation**

- 10.4.1. Basic Concepts
- 10.4.2. Hypothesis Testing
- 10.4.3. Model Coefficients

**10.5. Hypothesis Testing in Linear Regression Models**

- 10.5.1. T-Contrast
- 10.5.2. F-Contrast
- 10.5.3. Global Contrasts

**10.6. Confidence Intervals**

- 10.6.1. Objectives
- 10.6.2. In a Coefficient
- 10.6.3. In a Combination of Coefficients

**10.7. Specification Problems**

- 10.7.1. Use and Concept
- 10.7.2. Types of Problems
- 10.7.3. Unobservable Explanatory Variables

**10.8. Prediction in Linear Regression Models**

- 10.8.1. Prediction
- 10.8.2. Average Value Intervals
- 10.8.3. Applications

**10.9. Residual Analysis in Linear Prediction**

- 10.9.1. Objectives and General Concepts
- 10.9.2. Analysis Tools
- 10.9.3. Waste Analysis

**10.10. Qualitative Variables in GLRM I**

- 10.10.1. Fundamentals
- 10.10.2. Models with Various Types of Information
- 10.10.3. Linear Metrics

**10.11. Qualitative Variables in GLRM II**

- 10.11.1. Binary Variables
- 10.11.2. Use of Dummy Variables
- 10.11.3. Time Series

**10.12. Autocorrelation**

- 10.12.1. Basic Concepts
- 10.12.2. Consequences
- 10.12.3. Contrast

**10.13. Heteroscedasticity**

- 10.13.1. Concept and Contrasts
- 10.13.2. Consequences
- 10.13.3. Time Series



07

# Methodology

This academic program offers students a different way of learning. Our methodology uses a cyclical learning approach: **Relearning**.

This teaching system is used, for example, in the most prestigious medical schools in the world, and major publications such as the **New England Journal of Medicine** have considered it to be one of the most effective.







“

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

## TECH Business School uses the 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*”



*This program prepares you to face business challenges in uncertain environments and achieve business success.*



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

### A learning method that is different and innovative

This TECH program is an intensive educational program, created from scratch to present executives with challenges and business decisions at the highest level, whether at the national or international level. 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 business reality is taken into account.

“

*You will learn, through collaborative activities and real cases, how to solve complex situations in real business environments”*

The case method has been the most widely used learning system among the world's leading business 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 we face in the case method, an action-oriented learning method. Throughout the program, the studies will be presented with multiple real cases. They must integrate all their knowledge, research, 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.

*Our online system will allow you to organize your time and learning pace, adapting it to your schedule. You will be able to access the contents from any device with an internet connection.*

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 online business school is the only one in the world licensed to incorporate 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.

With this methodology we have 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, markets, and financial 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 specialization, developing a critical mindset, defending arguments, and contrasting opinions: a direct equation to 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.



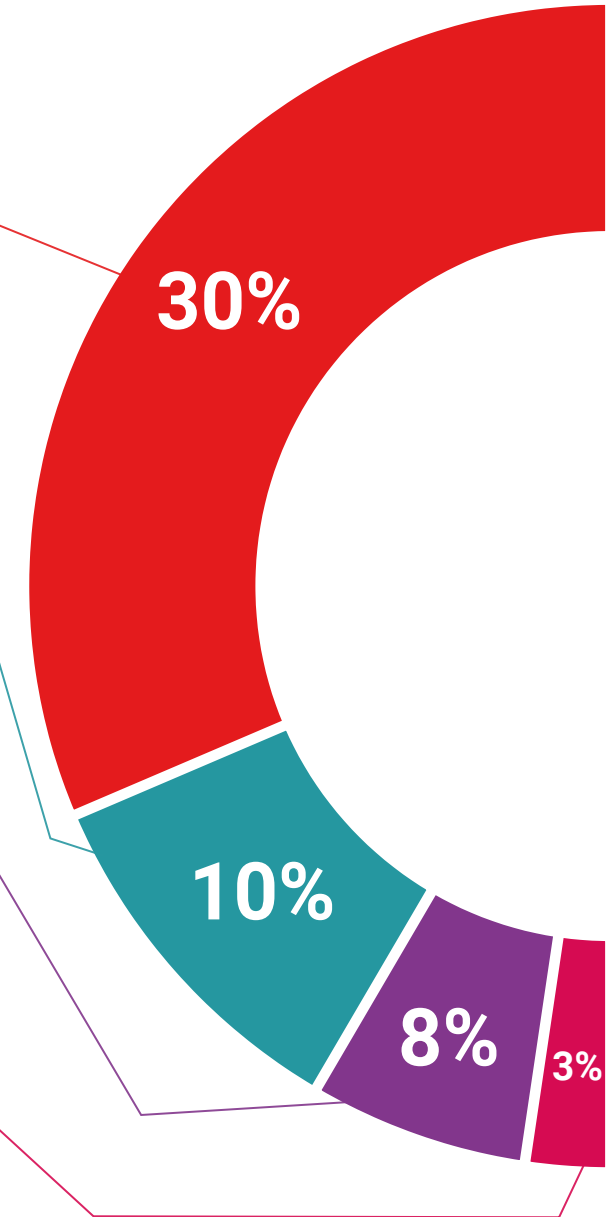
### Management Skills Exercises

They will carry out activities to develop specific executive competencies in each thematic area. Practices and dynamics to acquire and develop the skills and abilities that a high-level manager needs to develop in the context of the globalization we live in.



### 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 senior management 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.



08

# Our Students' Profiles

The Executive Master's Degree is aimed at university graduates who have previously studied accounting or economics. The program is intended for specialists to develop their business and management skills through the study of techniques and methods of mathematics within the financial framework of the company, as well as microeconomics and macroeconomics, in addition to the influence of economics on social policy.

This program uses a multidisciplinary approach as the students have a diverse set of academic profiles and represent multiple nationalities.

The Executive Master's Degree is also open to professionals who are university graduates in any field but have several years of work experience in the field of Financial Mathematics.







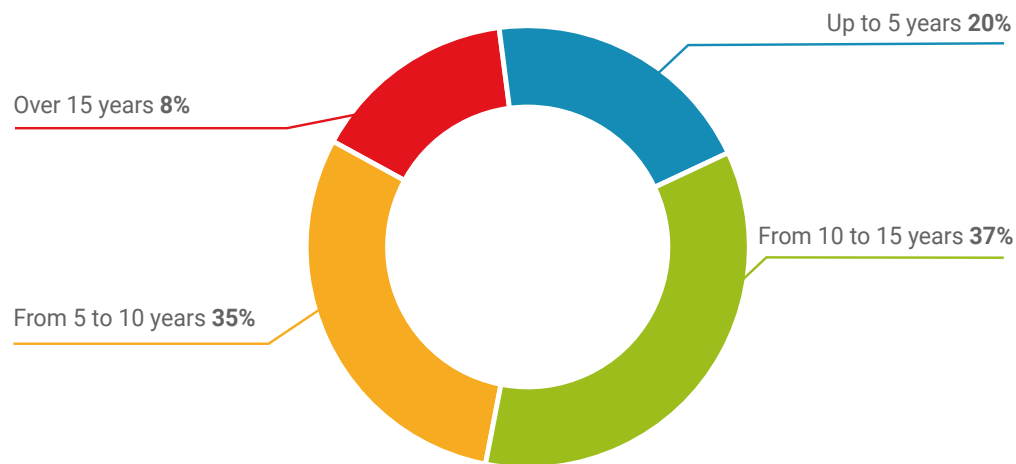
“

*If you have experience in Financial Mathematics, and are looking for an interesting improvement in your career while continuing to work, this is the program for you"*

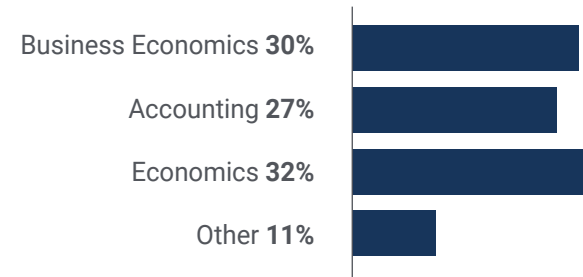
### Average Age

Between **35** and **45** years old

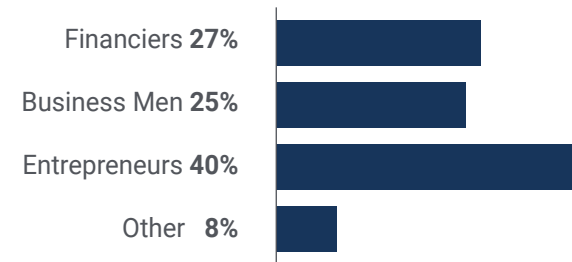
### Years of Experience



### Training

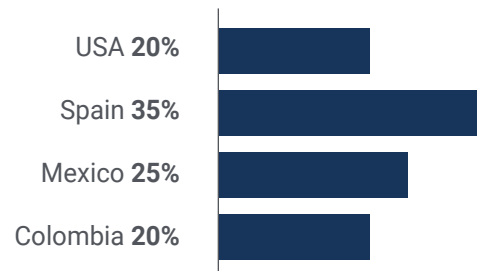


### Educational Profile



## Geographical Distribution

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## Hector Romero Ravelo

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Entrepreneur

*"This program has not only opened doors for me in the financial market, but has also pushed me to collaborate with other public and private organizations and, in this way, project my business positively. It has been a very enriching experience based on the latest developments that recent political changes have left in the international economic paradigm"*

09

# Impact on Your Career

In response to the lack of specialization of common academic degrees in Financial Mathematics, TECH offers a new innovative study method that is intended to project your professional career.

This program has been designed with the main objective that financial specialists will see their knowledge reflected after obtaining the diploma, increasing their business possibilities and intervention in the national economy.





“

*Delve into current economic possibilities and detect the best business options in a modern economic paradigm”*

**Are you ready to take the leap?  
Excellent professional development awaits you.**

TECH's Executive Master's Degree in Financial Mathematics is an intensive program that prepares you to face challenges and business decisions in the field of Financial Mathematics. Its main objective is to promote your personal and professional growth Helping students achieve success.

If you want to improve yourself, make a positive change professionally and network with the best, this is the place for you.

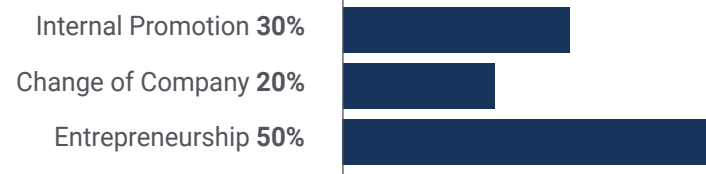
*Master the different techniques and the uses, techniques and existing mathematical methods within the financial framework of the company, thanks to TECH.*

*If you want to make a positive change in your profession, the Executive Master's Degree in Financial Mathematics will help you achieve it.*

**Time of Change**



**Type of change**



### Salary increase

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The completion of this program represents a salary increase of more than **25.3%** for our students.



10

# Benefits for Your Company

The Executive Master's Degree in Financial Mathematics contributes to raising the talent of the economic organization to its maximum potential through the instruction of high-level businessmen and financiers.

By studying in this Executive Master's Degree, students will find a unique opportunity to develop their knowledge through a teaching that adapts to them and their needs in a digital way, escaping from orthodox programs that do not focus on daily work practice.







“

*The entrepreneur who is up to date will contribute new concepts, strategies and perspectives to the company that can bring about essential changes in the organization”*

Developing and retaining talent in companies is the best long-term investment.

01

### Intellectual Capital and Talent Growth

The specialist who is qualified in the subject will be able to adapt the new concepts acquired to strategies and perspectives that can bring relevant changes in the organism.

---

02

### Retaining high-potential executives to avoid talent drain

This program strengthens the link between the company and the professional and opens new avenues for professional growth within the company, so that senior managers do not have to resort to experiences outside the country.

03

### Implementation of Effective Strategies and Techniques

The economic professional will be able to make decisions more easily taking into account the national and international environment and the scenario in which the business will develop, obtaining better results.

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04

### Increased Intervention Possibilities

Thanks to this program, the financial specialist will be able to intervene in other fields of action, such as economic policy and bilateral relations.



05

### **Project Development**

The professional will not only become highly capable of working on an external project, but will be able to create a real organization or develop new projects in the field of R & D.

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06

### **Increased competitiveness**

This Executive Master's Degree will equip students with the skills to take on new challenges and drive the organization forward.

# 11

# Certificate

This Executive Master's Degree in Financial Mathematics guarantees students, in addition to the most rigorous and up-to-date education, access to an Executive Master's Degree issued by TECH Technological University.



“

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

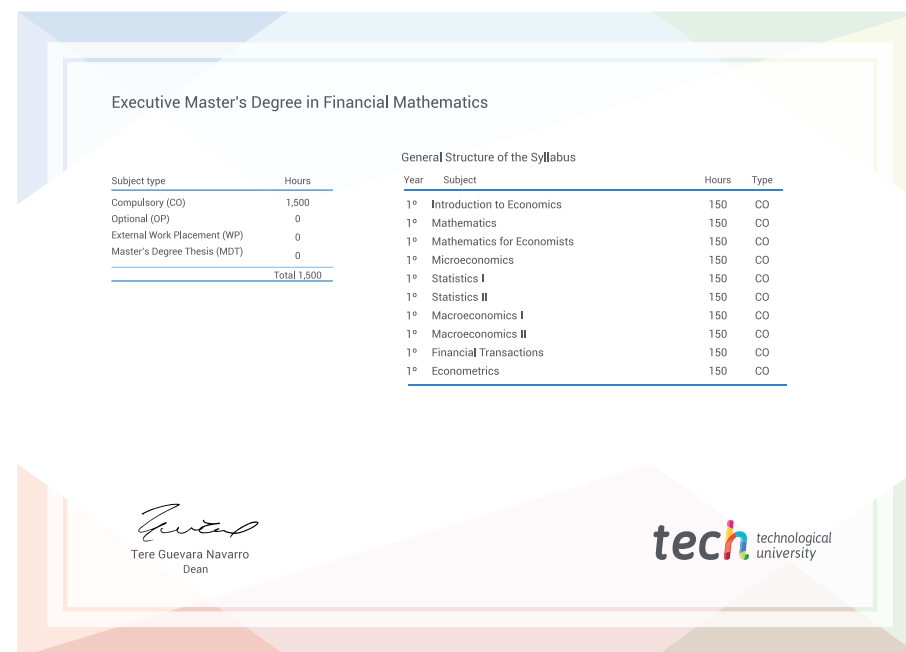
This **Executive Master's Degree in Financial Mathematics** contains the most complete and up-to-date program on the market.

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

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

Title: **Executive Master's Degree in Financial Mathematics**

Official N° of Hours: **1,500 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.



## Executive Master's Degree Financial Mathematics

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

# Executive Master's Degree Financial Mathematics

