

# Postgraduate Diploma

## Operations Research for Business



## Postgraduate Diploma Operations Research for Business

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

Website: [www.techtute.com/us/engineering/postgraduate-diploma/postgraduate-diploma-operations-research-business](http://www.techtute.com/us/engineering/postgraduate-diploma/postgraduate-diploma-operations-research-business)

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# 01

# Introduction

Thanks to operations research and appropriate decision making, progress can be made in solving problems in organizational environments. Thus, with the use of mathematical and statistical methods implementing the latest technological tools, all processes are facilitated. This translates into less risk and more benefits since the results can be carefully predicted; this is why companies constantly demand professionals trained in this area to obtain the proposed results and evolve their operations. Therefore, this training course has been developed with that purpose by experts, and through the most innovative methodology based on Relearning, which has been revolutionizing the current university study system. A 100% online degree and achievable in 6 months.





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*This program will allow you to advance to the next level in your career by implementing the most up-to-date knowledge in Operations Research for Business. Enroll now and become an expert in 6 months"*

Today's organizational environments require effective and evolved processes that reduce risks and increase benefits. With the correct application of research techniques in company operations, it is possible for managers to build effective systems that are based on complete data, consideration of all possible alternatives, careful prediction of results and the use of decision tools and techniques.

Studying problems through the scientific method, taking into account mathematical and statistical data, with the objective of solving organizational problems, applying observation, simulation and probability, requires specific knowledge in mathematical calculations, fundamentals of statistics and adequate mathematical methods and operational research. The use of professional specialists undoubtedly helps companies to achieve more complete data sets, consider all available options, predict all possible outcomes and estimate risk.

In this Postgraduate Diploma in Operations Research for Business, students will identify the applications of mathematical reasoning in industrial engineering, mastering the basic elements that make up business mathematics: linear and matrix algebra, matrices, matrix transposition, calculus, matrix inversion or systems of equations. They will be able to interpret quantitative results for making economic and management decisions in proposed situations. In addition, they will learn the usual statistical techniques in quality and reliability controls, as well as the probability models in proposed situations to finally know how to effectively communicate the results in written and oral form.

Therefore, this diploma focuses on providing the necessary knowledge to professionals who wish to specialize in the area of operations research to advance their career and raise their level of academic preparation, optimizing their curricular profile. All this is possible with the study of the content developed by experts in a comprehensive manner, taught through the most innovative methodology based on Relearning and the most secure and innovative educational platform, to achieve the degree in 6 months completely online.

The **Postgraduate Diploma in Operations Research for Business** contains the most complete and up-to-date program on the market. The most important features include:

- ◆ The development of practical cases presented by experts in Industrial Engineering
- ◆ 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



*Interpret quantitative results for economic and managerial decision making in proposed situations"*

“*You will learn to identify the applications of mathematical and statistical reasoning in Industrial Engineering to improve the management and administration of the company. Enroll now and stand out*”

*Become an expert in the area of operations research and offer advanced solutions to your company.*

*Study comfortably and at your own pace, with exclusive content for your 100% online professionalization.*

The program's teaching staff includes professionals from the sector who contribute their work experience to this educational program, as well as renowned specialists from leading societies and prestigious universities.

Its multimedia content, developed with the latest educational technology, will allow professionals to learn in a contextual and situated learning environment, i.e., a simulated environment that will provide immersive education programmed to prepare in real situations.

The design of this program focuses on Problem-Based Learning, by means of which professionals must try to solve the different professional practice situations that arise during the academic year. For this purpose, the student will be assisted by an innovative interactive video system created by renowned and experienced experts.



# 02

# Objectives

This Postgraduate Diploma in Operations Research for Business is designed to provide students with the necessary knowledge to understand the fundamentals of the calculations, statistics and tools necessary for the advanced solution of timely problems in the operation of the company and preventive analysis to be taken into account, appropriate to the 4.0 industry in specific contexts. In this way, multiple teaching resources are combined with the most advanced technology and study methodology, and with the most exclusive content of the current online university environment.







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*Being a professional expert in Operations Research for Business will open the way to countless job opportunities"*



## General Objectives

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- ◆ Obtain knowledge about the operational research of the company
- ◆ Understand the fundamentals of business mathematics and its appropriate use in the company's operations
- ◆ Delve deeper into statistical fundamentals to apply them to make company operational processes more effective
- ◆ Understand the scientific method to find advanced solutions to problems
- ◆ Delve into computer tools applied to the resolution of operational research problems in business
- ◆ Advance in organizational problem solving by applying the necessary calculations and tools according to current market demand





## Specific Objectives

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### Module 1. Mathematics III

- ◆ Know the basic elements that make up business mathematics: linear and matrix algebra, matrices, matrix transposition, calculus, matrix inversion or systems of equations
- ◆ Proper use of the basic elements within business organization
- ◆ Know the different existing mathematical techniques and methods
- ◆ Apply mathematical techniques and methods within the financial framework of the company
- ◆ Effectively communicate in written and oral form with clarity and rigor

### Module 2. Fundamentals of Statistics

- ◆ Apply descriptive statistics in proposed situations
- ◆ Apply probability models in proposed situations
- ◆ Define populations that can be studied statistically
- ◆ Design randomized experiments for case studies
- ◆ Formulate hypotheses about population distribution and test them against a chosen model
- ◆ Construct linear regression models to predict values of one variable as a function of others
- ◆ Apply the usual statistical techniques in quality and reliability checks

### Module 3. Mathematical Methods and Operations Research

- ◆ Identify the applications of mathematical reasoning in industrial engineering
- ◆ Apply the mathematical reasoning in industrial engineering to the company in proposed situations
- ◆ Identify phases and techniques in operations research and their application
- ◆ Apply mathematical functions in decision making to optimize resources in specific cases
- ◆ Interpret quantitative results for economic and managerial decision making in proposed situations
- ◆ Use mathematical calculation software for decision making in proposed cases
- ◆ Use computer tools applied to the resolution of operational research problems



*With this program you will be able to apply the mathematical reasoning of industrial engineering in the company in proposed situations. Enroll now”*

# 03

## Structure and Content

This advanced program has been structured in 3 modules, with content aimed at professionals in the industrial sector who wish to specialize in Operations Research for Business, taking into consideration the most influential concepts in the process of calculations and problem solving around decision making for the correct functioning of the company's operations, which will help them to achieve success in current and future competitive environments. The variety of multimedia resources and content in different formats will allow them to acquire specialized knowledge in a completely online, dynamic and efficient way.





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*Boost your career with exclusive training in Operations Research for Business and advance in competitive environments”*

## Module 1. Mathematics III

- 1.1. Multi-variable Functions
  - 1.1.1. Terminology and Basic Mathematical Concepts
  - 1.1.2. Definition of  $IR^n$  in  $IR^m$  Functions
  - 1.1.3. Graphic Representation
  - 1.1.4. Types of Functions
    - 1.1.4.1. Scaled Functions
      - 1.1.4.1.1. Concave Function and Its Application to Economic Research
      - 1.1.4.1.2. Convex Function and Its Application to Economic Research
      - 1.1.4.1.3. Level Curves
    - 1.1.4.2. Vectorial Functions
    - 1.1.4.3. Operations with Functions
- 1.2. Multi-variable Real Functions
  - 1.2.1. Function Limits
    - 1.2.1.1. Point Limit of a  $IR^n$  in  $IR^m$  Function
    - 1.2.1.2. Directional Limits
    - 1.2.1.3. Double Limits and Their Properties
    - 1.2.1.4. Limit of a  $IR^n$  in  $IR^m$  Function
  - 1.2.2. Continuity Study of Multi-variable Functions
  - 1.2.3. Function Derivatives: Successive and Partial Derivatives Concept of Differential of a Function
  - 1.2.4. Differentiation of Compound Functions: Chain Rule
  - 1.2.5. Homogeneous Functions
    - 1.2.5.1. Properties
    - 1.2.5.2. Euler's Theorem and Its Economic Interpretation
- 1.3. Optimization
  - 1.3.1. Definition
  - 1.3.2. Searching and Interpreting Optimum
  - 1.3.3. Weierstrass' Theorem
  - 1.3.4. Local-Global Theorem





- 1.4. Unconstrained and Constrained Equality Optimization
  - 1.4.1. Taylor's Theorem Applied to Multi-variable Functions
  - 1.4.2. Unconstrained Optimization
  - 1.4.3. Constrained Optimization
    - 1.4.3.1. Direct Method
    - 1.4.3.2. Interpreting Lagrange Multipliers
      - 1.4.3.2.1. Hessian Matrix
- 1.5. Optimization with Inequality Constraints
  - 1.5.1. Introduction
  - 1.5.2. Necessary First-order Conditions for the Existence of Local Optima: Kuhn-Tucker's Theorem and Its Economic Interpretation
  - 1.5.3. Globality Theorem: Convex Programming
- 1.6. Lineal Programming
  - 1.6.1. Introduction
  - 1.6.2. Properties
  - 1.6.3. Graphic Resolution
  - 1.6.4. Applying Kuhn-Tucker Conditions
  - 1.6.5. Simplex Method
  - 1.6.6. Economic Applications
- 1.7. Integral Calculus: Riemann's Integral
  - 1.7.1. Definition and Application in Economics
  - 1.7.2. Properties
  - 1.7.3. Integrability Conditions
  - 1.7.4. Relation between Integrals and Derivatives
  - 1.7.5. Integration by Parts
  - 1.7.6. Change of Variables Integration Method
- 1.8. Applications of Riemann's Integral in Business and Economics
  - 1.8.1. Distribution Function
  - 1.8.2. Present Value of a Cash Flow
  - 1.8.3. Mean Value of a Function in an Enclosure
  - 1.8.4. Pierre-Simon Laplace and His Contribution

- 1.9. Ordinary Differential Equations
  - 1.9.1. Introduction
  - 1.9.2. Definition
  - 1.9.3. Classification
  - 1.9.4. First Order Differential Equations
    - 1.9.4.1. Resolution
    - 1.9.4.2. Bernoulli's Differential Equations
  - 1.9.5. Exact Differential Equations
    - 1.9.5.1. Resolution
  - 1.9.6. Greater Than One Ordinary Differential Equations (with Constant Coefficients)
- 1.10. Finite Difference Equations
  - 1.10.1. Introduction
  - 1.10.2. Discrete Variable Functions or Discrete Functions
  - 1.10.3. First-order Linear Finite Difference Equations with Constant Coefficients
  - 1.10.4. Order n Linear Finite Difference Equations with Constant Coefficients
  - 1.10.5. Economic Applications

## Module 2. Fundamentals of Statistics

- 2.1. Introduction to Data Analysis
  - 2.1.1. Introduction
  - 2.1.2. Variables and Data: Types of Data
  - 2.1.3. Describing Data with Tables
  - 2.1.4. Describing Data with Graphs
  - 2.1.5. Introduction to Exploratory Data Analysis
- 2.2. Characteristic Measures in Frequency Distribution
  - 2.2.1. Introduction
  - 2.2.2. Position Measurements
  - 2.2.3. Measures of Dispersion
  - 2.2.4. Shape Measurements
  - 2.2.5. Relation Measurements

- 2.3. Probability Calculation
  - 2.3.1. Introduction
  - 2.3.2. Interpreting Probability
  - 2.3.3. Axiomatic Definition of Probability
  - 2.3.4. Quantifying Probability
  - 2.3.5. Conditional Probability
  - 2.3.6. Compound Probability Theorem
  - 2.3.7. Event Independence
  - 2.3.8. Total Probability Theorem
  - 2.3.9. Bayes' Theorem
  - 2.3.10. Annex: Counting Methods to Determine Probability
- 2.4. Random Variables
  - 2.4.1. Random Variable: Concept
  - 2.4.2. Types of Random Variables
  - 2.4.3. Probability Distributions of Random Variables
  - 2.4.4. Characteristic Measures of Random Variables
  - 2.4.5. Chebyshev's Inequality
- 2.5. Discrete and Continuous Random Variables
  - 2.5.1. Discrete Uniform Distribution on n Points
  - 2.5.2. Bernoulli's Distribution
  - 2.5.3. Binomial Distribution
  - 2.5.4. Geometric Distribution
  - 2.5.5. Negative Binomial Distribution
  - 2.5.6. Poisson distribution
  - 2.5.7. Uniform Distribution
  - 2.5.8. Normal or Gaussian Distribution
  - 2.5.9. Gamma Distribution
  - 2.5.10. Beta Distribution



- 2.6. Multidimensional Random Variables
  - 2.6.1. Bidimensional Random Variables: Joint Distribution
  - 2.6.2. Marginal Distributions
  - 2.6.3. Conditional Distributions
  - 2.6.4. Independence
  - 2.6.5. Moments
  - 2.6.6. Bayes' Theorem
  - 2.6.7. Bivariate Normal Distribution
- 2.7. Introduction to Inference Statistics
  - 2.7.1. Introduction
  - 2.7.2. Sampling
  - 2.7.3. Types of Sampling
  - 2.7.4. Simple Random Sample
  - 2.7.5. Sample Mean: Properties
  - 2.7.6. Large Number Laws
  - 2.7.7. Asymptotic Distribution of the Sample Mean
  - 2.7.8. Distributions Associated with Normal Distribution
- 2.8. Estimate
  - 2.8.1. Introduction
  - 2.8.2. Statistics and Estimators
  - 2.8.3. Properties of Estimators
  - 2.8.4. Estimation Methods
  - 2.8.5. Estimators in Normal Distribution: Fisher's Theorem
  - 2.8.6. Confidence Intervals Pivot Variable Method
  - 2.8.7. Confidence Intervals in Normal Populations
  - 2.8.8. Asymptotic Confidence Intervals: Confidence Intervals for Proportions
- 2.9. Hypothesis Testing
  - 2.9.1. Initial Motivation Example
  - 2.9.2. Basic Concepts
  - 2.9.3. Rejection Region
  - 2.9.4. Hypothesis Testing for Normal Distribution Parameters
  - 2.9.5. Proportions Testing
  - 2.9.6. Relation between Confidence Intervals and Hypothesis Testing Parameters
  - 2.9.7. Non-parametric Hypothesis Testing

- 2.10. Linear Regression Models
  - 2.10.1. Introduction
  - 2.10.2. Simple Linear Regression Models Hypothesis
  - 2.10.3. Methodology
  - 2.10.4. Parameter Estimation
  - 2.10.5. Parameter Inferences
  - 2.10.6. Regression Testing: ANOVA Table
  - 2.10.7. Residual Hypothesis Testing
  - 2.10.8. Determination Coefficient and Linear Correlation Coefficient
  - 2.10.9. Predictions
  - 2.10.10. Introduction to the Multiple Linear Regression Model

### Module 3. Mathematical Methods and Operations Research

- 3.1. Introduction to Operations Research
  - 3.1.1. History of Operations Research
  - 3.1.2. Applications
  - 3.1.3. Operations Research Stages
  - 3.1.4. Operations Research Techniques
  - 3.1.5. Implementation
- 3.2. Lineal Programming: Formulating Problems
  - 3.2.1. Linear Programming Modeling
  - 3.2.2. Graphic Method
  - 3.2.3. Approaching Lineal Programming Problems
  - 3.2.4. Applications and Examples
- 3.3. Simplex Method
  - 3.3.1. Set and Convex Functions
  - 3.3.2. Resolution Algorithms
  - 3.3.3. Simplex Method Algebra: Algorithm Calculus
  - 3.3.4. Post-Optimum Analysis
  - 3.3.5. Revised Simplex Method

- 3.4. Duality Theory
  - 3.4.1. Introduction to Duality
  - 3.4.2. Duality Theory
  - 3.4.3. Economic Interpretation of Duality
  - 3.4.4. Dual Simplex Algorithm
- 3.5. Post-Optimization
  - 3.5.1. Need for Post-optimal Analysis
  - 3.5.2. Sensitivity Analysis
  - 3.5.3. Parametric Analysis
  - 3.5.4. Linear Programming Model Solutions Using Spreadsheets
- 3.6. Transport Problems
  - 3.6.1. Introduction
  - 3.6.2. Transport Simplex Method
  - 3.6.3. Dummy Destination and Origin
  - 3.6.4. Degenerate Solutions
  - 3.6.5. Impossible Transports: M Method
- 3.7. Allocation Problems
  - 3.7.1. Introduction
  - 3.7.2. Hungarian Algorithm
  - 3.7.3. Dummy Resources
  - 3.7.4. Dummy Tasks for Resources Unable to Perform a Certain Task
- 3.8. Network Optimization: Project Planning Application
  - 3.8.1. Types of Network Optimization Models
  - 3.8.2. Monte Carlo Method
  - 3.8.3. Planning and Programming Projects
  - 3.8.4. Defining and Sequencing Activities
  - 3.8.5. Critical Path Method (CPM) with Cost/Time Trade-offs
  - 3.8.6. ROY Method
- 3.9. Dynamic Programming
  - 3.9.1. Dynamic Programming Problem Features
  - 3.9.2. Dynamic Programming Prototype
  - 3.9.3. Deterministic Dynamic Programming





- 3.10. Integer Programming and Nonlinear Programming
  - 3.10.1. Integer Programming Applications
  - 3.10.2. Integer Programming Prototype
  - 3.10.3. Non-Linear Programming
  - 3.10.4. Non-Linear Programming Applications
  - 3.10.5. Graphic Solutions for Non-Linear Programming Problems

“*Enroll now and become an expert in Operations Research for Business in just 6 months and completely online*”

04

# Methodology

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

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





“

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

## Case Study to contextualize all content

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

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



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



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

### A learning method that is different and innovative

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

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

The case method is the most widely used learning system in the best faculties in the world. The case method was developed in 1912 so that law students would not only learn the law based on theoretical content. It consisted of presenting students with real-life, complex situations for them to make informed decisions and value judgments on how to resolve them. In 1924, Harvard adopted it as a standard teaching method.

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

## Relearning Methodology

TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines 8 different teaching elements in each lesson.

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

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

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

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





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

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

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

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

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



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



### Study Material

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

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



### Classes

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

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



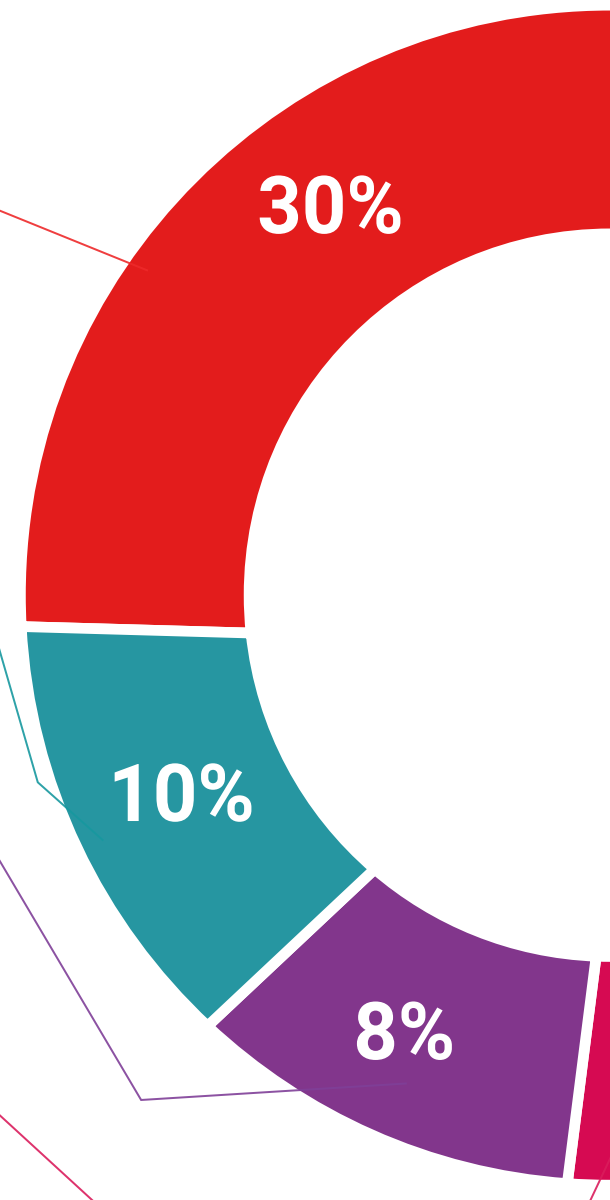
### Practising Skills and Abilities

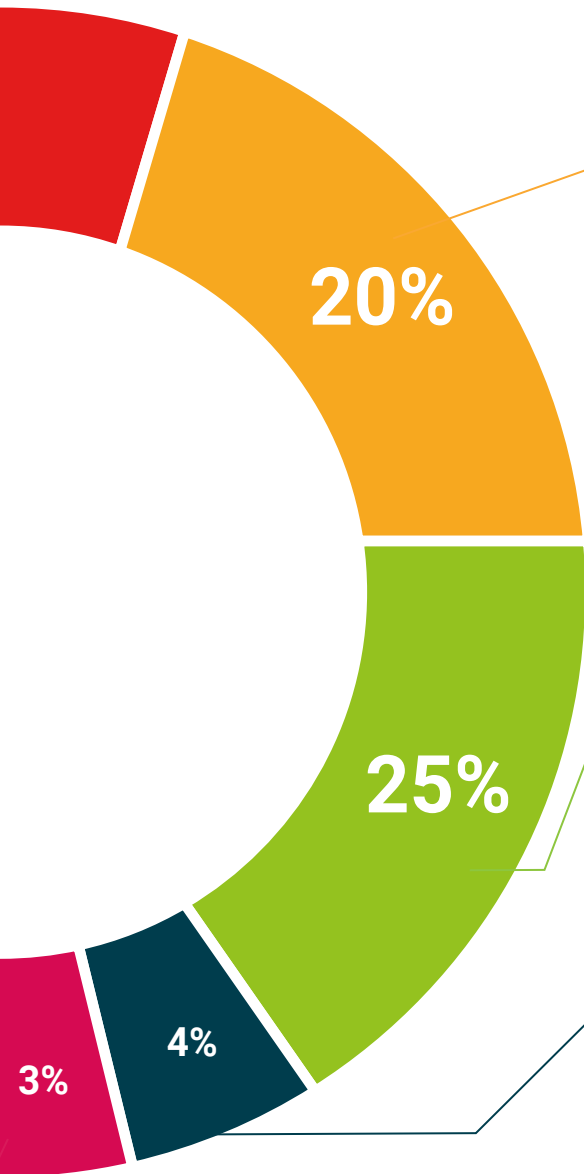
They will carry out activities to develop specific skills and abilities in each subject area. Exercises and activities to acquire and develop the skills and abilities that a specialist needs to develop in the context of the globalization that we are experiencing.



### Additional Reading

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





#### Case Studies

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



#### Interactive Summaries

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

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



#### Testing & Retesting

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



05

# Certificate

The Postgraduate Diploma in Operations Research for Business guarantees students, in addition to the most rigorous and up-to-date education, access to a diploma issued by TECH Technological University.



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

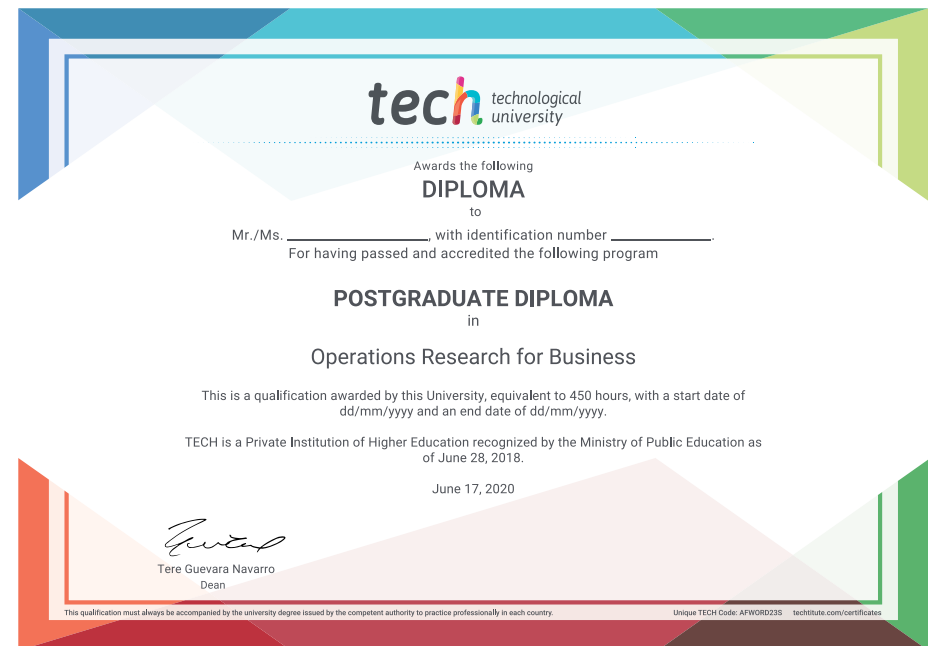
The **Postgraduate Diploma in Operations Research for Business** contains the most complete and up-to-date program on the market.

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

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

Title: **Postgraduate Diploma in Operations Research for Business**

Official N° of Hours: **450 h.**



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



## Postgraduate Diploma Operations Research for Business

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