

# Postgraduate Certificate Human-Machine Interaction Systems



## Postgraduate Certificate Human-Machine Interaction Systems

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

Website: [www.techtitute.com/us/information-technology/postgraduate-certificate/human-machine-interaction-systems](http://www.techtitute.com/us/information-technology/postgraduate-certificate/human-machine-interaction-systems)

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# 01

# Introduction

The development of robots has allowed humans to access places on Earth or even outside it to perform tasks that would be impossible without the use of machines. This progress has been progressive and very useful for different economic sectors such as industry, aeronautics, naval or even leisure. The multiple applications have led to the revaluation of professionals responsible for the creation and development of robots. This 100% online program provides education in the field of Robotics, especially for IT professionals who wish to progress in this field.





“

*A program with a theoretical-practical approach of great application in the Robotics field. Enroll now”*



The advancement of technology has led to a significant increase in Augmented and Virtual Reality in recent years, as well as the interaction that humans can have with machines. A progression that will be studied in depth in this Postgraduate Certificate through innovative multimedia content provided by a teaching team specialized in the field of Robotics.

A 100% online program that will allow students for 6 weeks to acquire advanced knowledge in the main techniques and tools used in computer vision, image synthesis, applying the main mathematical models of robots to the physical engines found in Virtual Reality tools.

A program that provides the most updated teaching material to which you can access the latest developments in the development of natural language and development of mechanisms of interaction between humans and robots. A program designed for students to reach quotas of improvement in their career while combining their work and/or personal responsibilities with quality education. The student only needs an electronic device with internet connection to access the syllabus, wherever and whenever they wish. An opportunity to progress with a program that uses the Relearning system, which will allow you to reduce long hours of study and acquire a solid learning in a more natural way.

This **Postgraduate Certificate in Human-Machine Interaction Systems** contains the most complete and up-to-date program on the market. The most important features include:

- ◆ Development of case studies presented by experts in robotic 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



*Advance in your career with the most updated learning in robot dynamics and kinematics modeling”*

“

*The Robotics sector is growing, take advantage of this opportunity and add another step in your career”*

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 provide the professional with situated and contextual learning, i.e., a simulated environment that will provide an immersive education programmed to learn in real situations.

The design of this program focuses on Problem-Based Learning, by means of which the professionals must try to solve the different professional practice situations that are presented throughout the program. For this purpose, students will be assisted by an innovative interactive video system developed by renowned experts.

*TECH brings you the Relearning learning system, which will allow you to reduce long hours of study.*

*Enroll now and acquire the most updated knowledge in the improvement of expressiveness in robots.*



# 02 Objectives

The objective of this Postgraduate Certificate is to achieve that IT professionals acquire a deep knowledge in the field of Robotics and human-machine interaction. An education that will allow them, upon completion of the 6-week program, to establish the best strategies to apply in the processing of natural language, using the indispensable tools for it. The educational content and the specialized teaching staff of this program will be key to the achievement of the students' goals.





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*Be able to develop Virtual and Augmented Reality projects, thanks to this Postgraduate Certificate”*



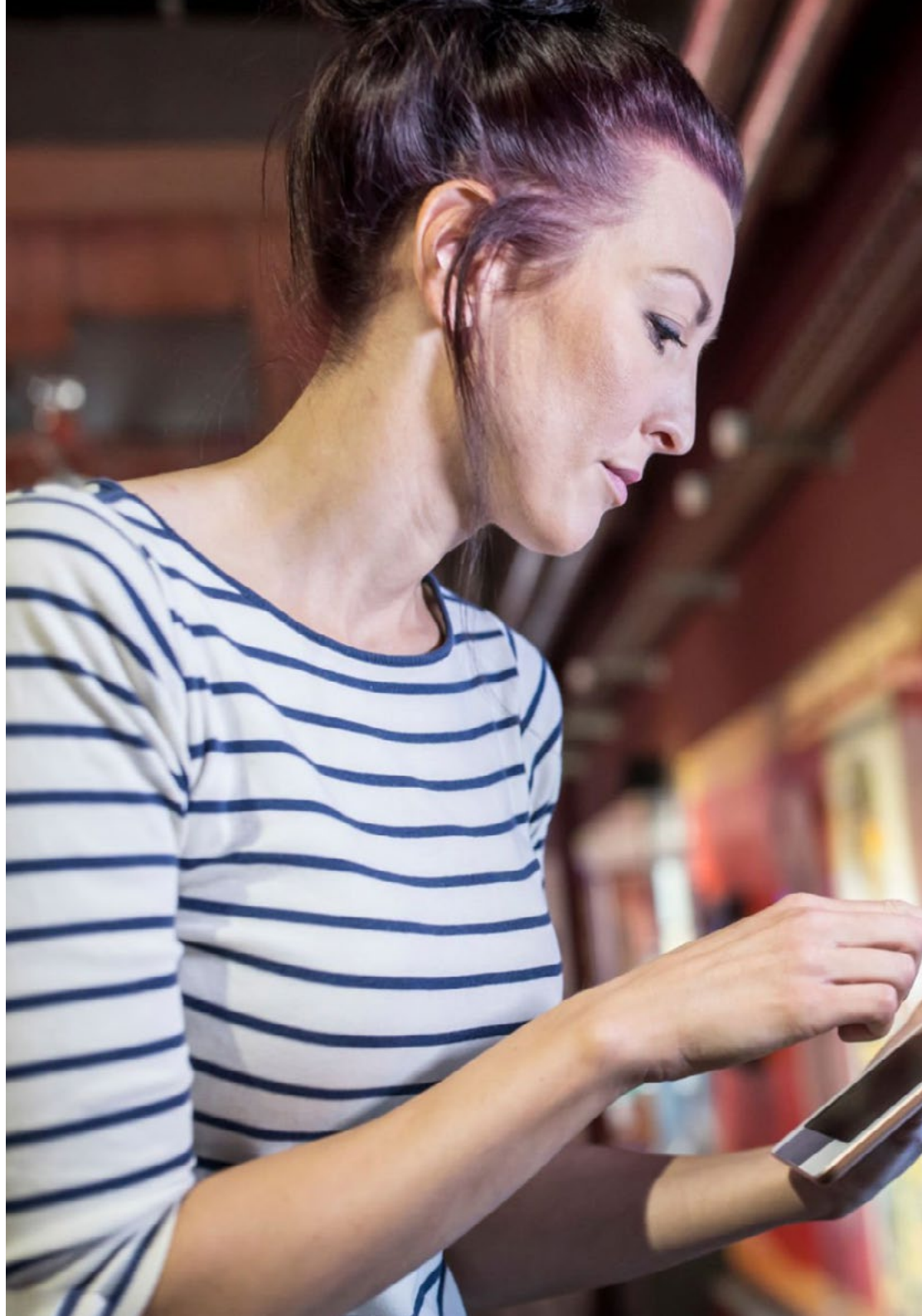
## General Objectives

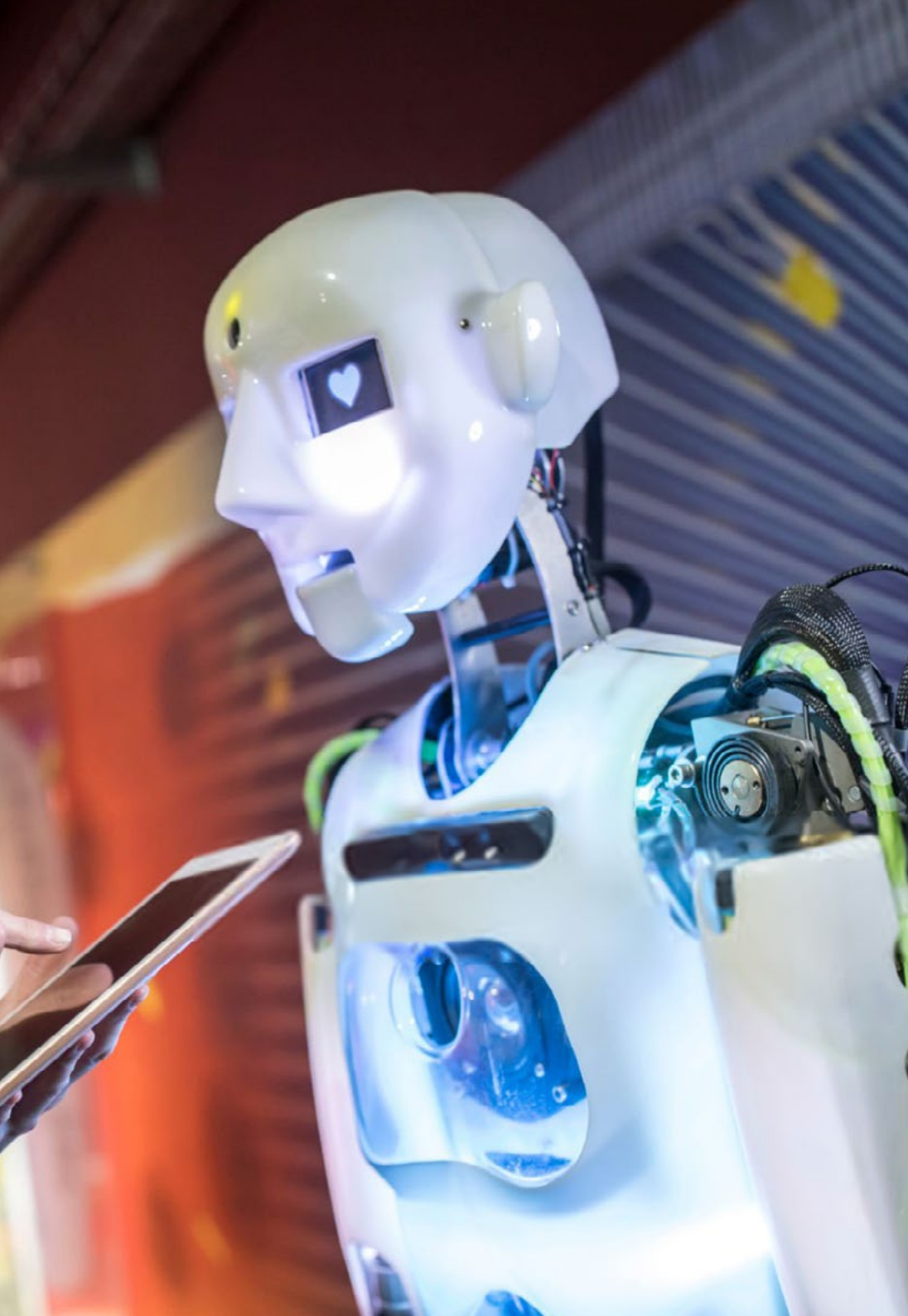
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- ◆ Develop the theoretical and practical foundations necessary to carry out a robot design and modeling project
- ◆ Provide the graduates with an exhaustive knowledge of the automation of industrial processes that will allow them to develop their own strategies
- ◆ Acquire the professional skills of an expert in automatic control systems in Robotics

“

*Be the creator of the next breakthrough in Human-Machine Interaction. Advance yourself in your Knowledge with this Postgraduate Certificate. Enroll now”*





## Specific Objectives

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- ◆ Determine the difference among the different types of realities
- ◆ Analyze the current standards for modeling virtual elements
- ◆ Examine the most commonly used peripherals in immersive environments
- ◆ Define geometric models of robots
- ◆ Assess physics engines for dynamic and kinematic modeling of robots
- ◆ Develop Virtual Reality and Augmented Reality projects
- ◆ Analyze current natural language processing strategies: heuristic, stochastic, neural network-based, reinforcement-based learning
- ◆ Assess the benefits and weaknesses of developing cross-cutting, or situation-focused, interaction systems
- ◆ Identify the environmental problems to be solved in order to achieve effective communication with the robot
- ◆ Establish the tools needed to manage the interaction and discern the type of dialogue initiative to be pursued
- ◆ Combine pattern recognition strategies to infer the intentions of the interlocutor and respond in the best way to them
- ◆ Determine the optimal expressiveness of the robot according to its functionality and environment, and apply emotional analysis techniques to adapt its response
- ◆ Propose hybrid strategies for interaction with the robot: vocal, tactile and visual



# 03

## Course Management

The management of this Postgraduate Certificate and the faculty teaching this program have been selected by TECH for their high qualifications and professional experience in the field of Robotics and Engineering. Their extensive knowledge of Human-Machine Interaction, will allow students who take this online program, to be aware of recent developments in this field, as well as the many advances that can be developed in this area. Likewise, the human quality of the teaching staff will allow the IT professionals to acquire deep knowledge in a closer and more direct way.



“

*Specialize with a team of experts  
with extensive professional  
experience in the field of Robotics”*



## International Guest Director

Seshu Motamarri is an expert in **automation and robotics** with more than **20 years of experience** in various industries such as **e-commerce, automotive, oil and gas, food and pharmaceutical**. Throughout his career, he has specialized in **engineering management** and innovation and in the implementation of new technologies, always looking for **scalable and efficient** solutions. He has also made important contributions in the introduction of products and solutions that optimize both safety and productivity in **complex industrial environments**.

He has also held key positions, including **Senior Director of Automation and Robotics at 3M**, where he leads cross-functional teams to develop and implement advanced automation solutions. At Amazon, his role as **Technical Lead** led him to manage projects that significantly improved the global supply chain, such as the “SmartPac” semi-automated bagging system and the robotic **smart picking and stowage** solution. His skills in project management, operational planning and product development have enabled him to generate great results in large-scale projects.

Internationally, he is recognized for his achievements in IT. He has been awarded the prestigious **Amazon Door Desk Award** by Jeff Bezos, and has received the **Excellence in Manufacturing Safety Award**, reflecting his hands-on engineering approach. In addition, he has been a “**Bar Raiser**” at Amazon, participating in over **100 interviews** as an objective evaluator in the hiring process.

In addition, he has several patents and publications in **electrical engineering** and functional safety, reinforcing his impact on the **development of advanced technologies**. His projects have been implemented globally, with highlights in regions such as North America, Europe, Japan and India, where he has driven the adoption of sustainable solutions in the industrial and **e-commerce** sectors.



## D. Motamarri, Seshu

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- ♦ Senior Director of Global Manufacturing Technology at 3M, Arkansas, United States
- ♦ Director of Automation and Robotics at Tyson Foods
- ♦ Hardware Development Manager III at Amazon
- ♦ Automation Leader at Corning Incorporated
- ♦ Founder and member of Quest Automation LLC
- ♦ Master of Science (MS), Electrical and Electronics Engineering at University of Houston
- ♦ Bachelor of Engineering (B.E.), Electrical and Electronics Engineering, University of Andhra
- ♦ Certification in Machinery, TÜV Rheinland Group



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

## Management



### Dr. Ramón Fabresse, Felipe

- ♦ Senior Software Engineer at Acurable
- ♦ NLP Software Engineer at Intel Corporation
- ♦ Software Engineer in CATEC, Indisys
- ♦ Researcher in Aerial Robotics at the University of Seville
- ♦ PhD Cum Laude in Robotics, Autonomous Systems and Telerobotics at the University of Seville
- ♦ Degree in Computer Engineering at the University of Seville
- ♦ Master's Degree in Robotics, Automation and Telematics at the University of Seville

## Professors

### Dr. Lucas Cuesta, Juan Manuel

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





# 04

## Structure and Content

The syllabus of this program has been prepared following the strict guidelines of the teaching team. Thus, students taking this program will have at their disposal video summaries, specialized readings and real case studies in the two modules into which this syllabus has been divided. In the first module, the IT professionals will learn the most advanced knowledge in the field of Augmented, Virtual and Mixed Reality applied to Robotics; in the second module, they will learn about Robot Communication and Interaction Systems. Thanks to the flexibility that TECH grants to all its programs, students will be able to access the complete syllabus of this program from the first day, distributing the course load according to their needs.







“

*A Postgraduate Certificate in  
which you will be able to delve into  
Immersive Technologies in Robotics”*

## Module 1. Application to Robotics of Virtual and Augmented Reality Technologies

- 1.1. Immersive Technologies in Robotics
  - 1.1.1. Virtual Reality in Robotics
  - 1.1.2. Augmented Reality in Robotics
  - 1.1.3. Mixed Reality in Robotics
  - 1.1.4. Difference between Realities
- 1.2. Construction of Virtual Environments
  - 1.2.1. Materials and Textures
  - 1.2.2. Lighting
  - 1.2.3. Virtual Sound and Smell
- 1.3. Robot Modeling in Virtual Environments
  - 1.3.1. Geometric Modeling
  - 1.3.2. Physical Modeling
  - 1.3.3. Model Standardization
- 1.4. Modeling of Robot Dynamics and Kinematics Virtual Physical Engines
  - 1.4.1. Physical Motors. Typology
  - 1.4.2. Configuration of a Physical Engine
  - 1.4.3. Physical Motors in the Industry
- 1.5. Platforms, Peripherals and Tools Most Commonly Used in Virtual Reality
  - 1.5.1. Virtual Reality Viewers
  - 1.5.2. Interaction Peripherals
  - 1.5.3. Virtual Sensors
- 1.6. Augmented Reality Systems
  - 1.6.1. Insertion of Virtual Elements into Reality
  - 1.6.2. Types of Visual Markers
  - 1.6.3. Augmented Reality Technologies
- 1.7. Metaverse: Virtual Environments of Intelligent Agents and People
  - 1.7.1. Avatar Creation
  - 1.7.2. Intelligent Agents in Virtual Environments
  - 1.7.3. Construction of Multi-User Environments for VR/AR

- 1.8. Creation of Virtual Reality Projects for Robotics
  - 1.8.1. Phases of Development of a Virtual Reality Project
  - 1.8.2. Deployment of Virtual Reality Systems
  - 1.8.3. Virtual Reality Resources
- 1.9. Creating Augmented Reality Projects for Robotics
  - 1.9.1. Phases of Development of an Augmented Reality Project
  - 1.9.2. Deployment of Augmented Reality Projects
  - 1.9.3. Augmented Reality Resources
- 1.10. Robot Teleoperation with Mobile Devices
  - 1.10.1. Mixed Reality on Mobile Devices
  - 1.10.2. Immersive Systems using Mobile Device Sensors
  - 1.10.3. Examples of Mobile Projects

## Module 2. Robot Communication and Interaction Systems

- 2.1. Speech Recognition: Stochastic Systems
  - 2.1.1. Acoustic Speech Modeling
  - 2.1.2. Hidden Markov Models
  - 2.1.3. Linguistic Speech Modeling: N-Grams, BNF Grammars
- 2.2. Speech Recognition. Deep Learning
  - 2.2.1. Deep Neural Networks
  - 2.2.2. Recurrent Neural Networks
  - 2.2.3. LSTM Cells
- 2.3. Speech Recognition: Prosody and Environmental Effects
  - 2.3.1. Ambient Noise
  - 2.3.2. Multi-Speaker Recognition
  - 2.3.3. Speech Pathologies
- 2.4. Natural Language Understanding: Heuristic and Probabilistic Systems
  - 2.4.1. Syntactic-Semantic Analysis: Linguistic Rules
  - 2.4.2. Comprehension Based on Heuristic Rules
  - 2.4.3. Probabilistic Systems: Logistic Regression and SVM
  - 2.4.4. Understanding Based on Neural Networks



- 2.5. Dialog Management: Heuristic/Probabilistic Strategies
  - 2.5.1. Interlocutor's Intention
  - 2.5.2. Template-Based Dialog
  - 2.5.3. Stochastic Dialog Management: Bayesian Networks
- 2.6. Dialog Management: Advanced Strategies
  - 2.6.1. Reinforcement-Based Learning Systems
  - 2.6.2. Neural Network-Based Systems
  - 2.6.3. From Speech to Intention in a Single Network
- 2.7. Response Generation and Speech Synthesis
  - 2.7.1. Response Generation: From Idea to Coherent Text
  - 2.7.2. Speech Synthesis by Concatenation
  - 2.7.3. Stochastic Speech Synthesis
- 2.8. Dialog Adaptation and Contextualization
  - 2.8.1. Dialog Initiative
  - 2.8.2. Adaptation to the Speaker
  - 2.8.3. Adaptation to the Context of the Dialogue
- 2.9. Robots and Social Interactions: Emotion Recognition, Synthesis and Expression
  - 2.9.1. Artificial Voice Paradigms: Robotic Voice and Natural Voice
  - 2.9.2. Emotion Recognition and Sentiment Analysis
  - 2.9.3. Emotional Voice Synthesis
- 2.10. Robots and Social Interactions: Advanced Multimodal Interfaces
  - 2.10.1. Combination of Vocal and Tactile Interfaces
  - 2.10.2. Sign Language Recognition and Translation
  - 2.10.3. Visual Avatars: Voice to Sign Language Translation

“*Enroll now and learn about the latest advances in Deep Learning*”



# 05 Methodology

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

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



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

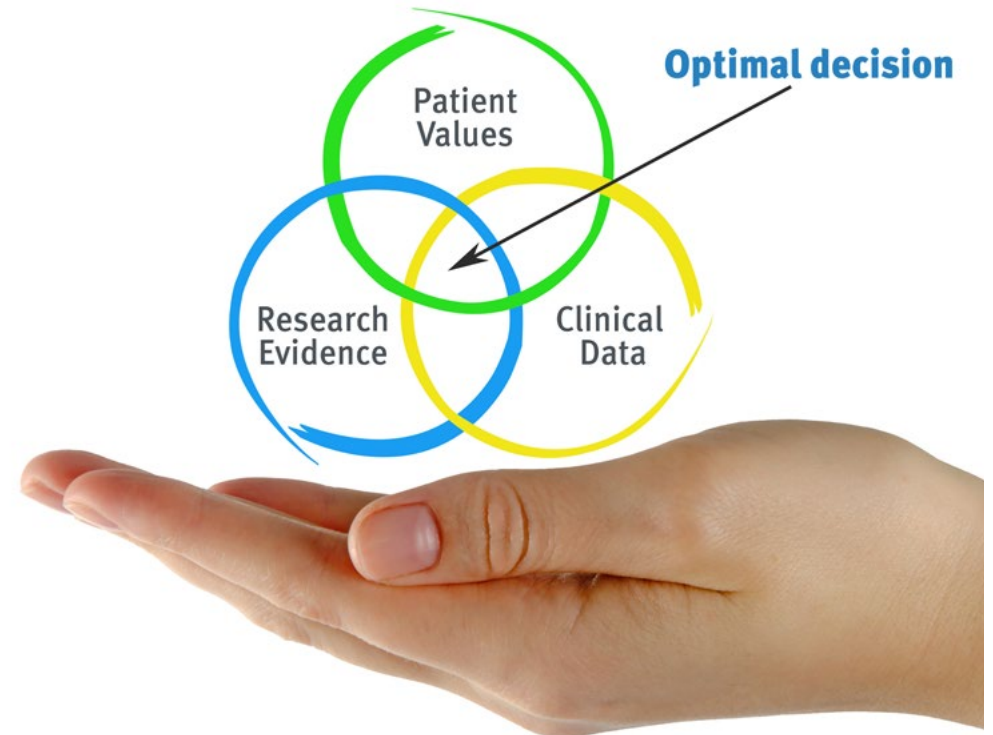


## Case Study to contextualize all content

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

“

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



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



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

### A learning method that is different and innovative

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

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

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

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

## Relearning Methodology

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

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

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

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

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





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

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

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

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

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





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



### Study Material

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

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



### Classes

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

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



### Practising Skills and Abilities

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



### Additional Reading

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





#### Case Studies

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



#### Interactive Summaries

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

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



#### Testing & Retesting

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



06

# Certificate

The Postgraduate Certificate in Human-Machine Interaction Systems guarantees students, in addition to the most rigorous and up-to-date education, access to a Postgraduate Certificate issued by TECH Technological University.





The image features two black graduation caps (mortarboards) against a bright blue sky with light, wispy clouds. The caps are positioned diagonally, with one in the foreground and another slightly behind it. The bottom right corner of the image is overlaid with a white triangular shape that contains text.

“

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

This **Postgraduate Certificate in Human-Machine Interaction Systems** 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 Certificate** issued by **TECH Technological University** via tracked delivery\*.

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

Title: **Postgraduate Certificate in Human-Machine Interaction Systems**

Official N° of Hours: **300 h.**



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

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

**tech** technological  
university

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