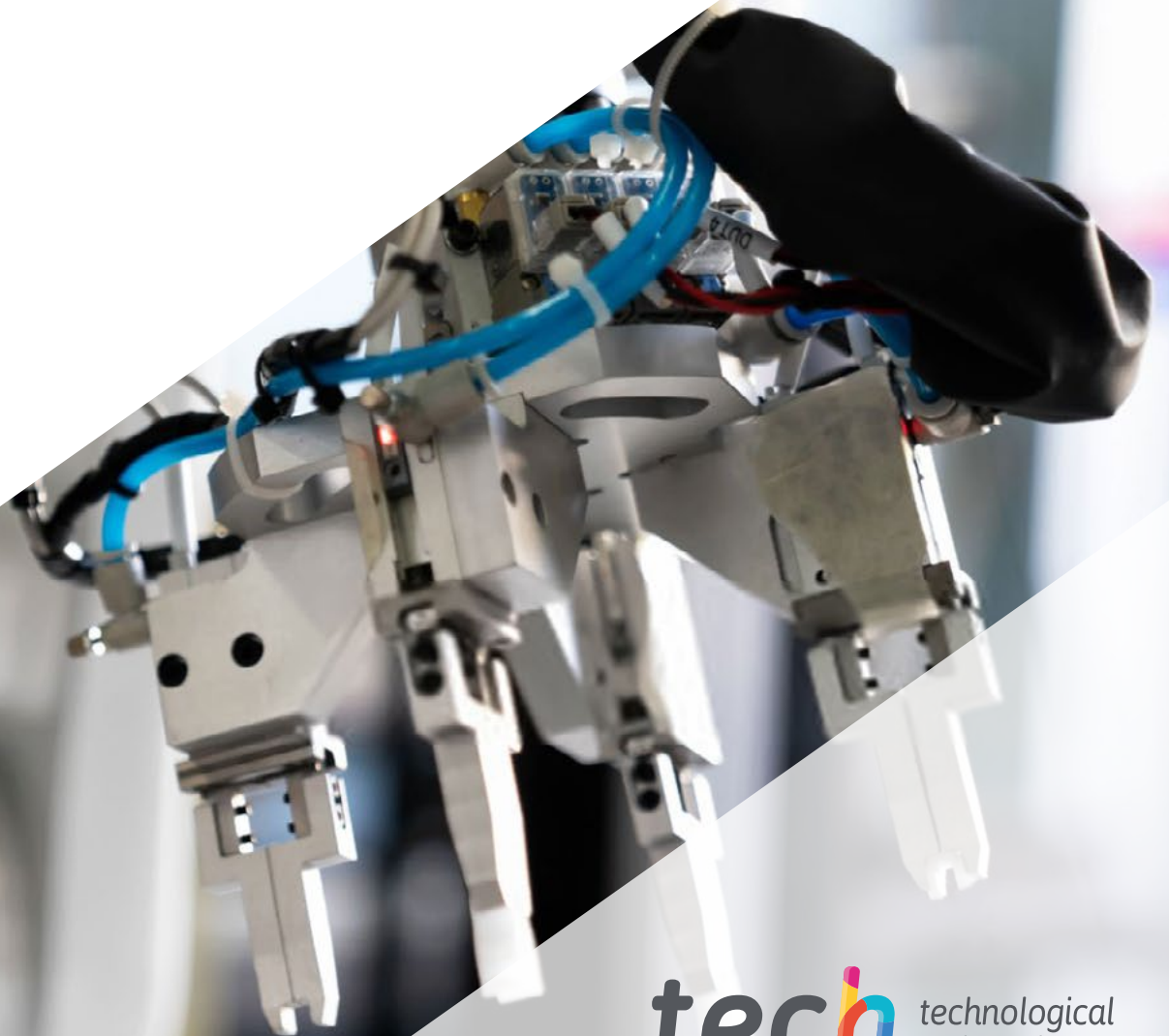


# Postgraduate Diploma Robot Interaction Tools





## Postgraduate Diploma Robot Interaction Tools

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

Website: [www.techtute.com/pk/information-technology/postgraduate-diploma/postgraduate-diploma-robot-interaction-tools](http://www.techtute.com/pk/information-technology/postgraduate-diploma/postgraduate-diploma-robot-interaction-tools)

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# 01

# Introduction

Robotics has gained momentum in recent years as it has been integrated into people's daily lives, even in their own homes, reducing the time required to perform certain tasks. In this incorporation into daily life, there is the need to maintain a human-robot link. In this interaction, the IT staff plays a great role, their mastery in the field of language in the design and modeling phase is key. This 100% online program provides a qualification that will allow progress in this field thanks to a quality and complete content in the field of Robotics. Specialized teaching staff will be essential for students to achieve their goal.





“

*Specialize in Industry 4.0 and you will be able to meet the challenge of improving communication in the field of Robotics”*



Current mechanisms for interacting with robots use natural language, although it is common to reduce communication with robots to a minimal component with preprogrammed commands, using manual interfaces such as joysticks, meaning mobile applications become simpler. However, the current challenge in the field of Robotics is to achieve a much more fluid dialog between the robot and the human being.

This Postgraduate Diploma provides the IT professional with all the necessary tools to achieve the mechanisms of recognition and synthesis of emotions oriented to provide the robot with a certain emotional intelligence on the one hand, and on the other, to make it capable of reacting with different emotions depending on the reactions of the users.

A challenge that will be possible thanks to the application of all the learning achieved in this program and with the help of a team of professionals specialized in the field of Robotics. This program also includes an extensive content that covers virtual and augmented reality technologies, as well as the design and modeling of robots.

This online program offers students an opportunity to achieve a preparation that will allow them to progress in their career in a field that requires creativity and highly qualified personnel. This program uses a Relearning system and multimedia content that will favor the acquisition of knowledge in an agile and comfortable way.

This **Postgraduate Diploma in Robot Interaction Tools** 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



*Join a program where you will master the modeling and simulation of terrestrial, aerial or aquatic manipulator robots”*

“

*Boost your career with a program that adapts to you. Without fixed schedules, or in-person classes”*

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 professional must try to solve the different professional practice situations that are presented throughout the academic course. This will be done with the help of an innovative system of interactive videos made by renowned experts.

*Enroll now in a program that will show you all the possibilities of Robotics and Industry 4.0.*

*Delve into the most advanced strategies in programming dialogs with robots.*



# 02 Objectives

This Postgraduate Diploma is prepared by a team of professionals who seek that upon completion of the 6-month program, students will be able to master the use of URDF robot modeling language, establish the best hybrid strategies of interaction with the robots: vocal, tactile and visual, and ultimately to create their own Robotics project. The case studies provided by the teaching staff will be key to acquire a more real and simple learning for the students.







“

*Thanks to this online program,  
you will master the most used  
tools in Virtual Reality”*



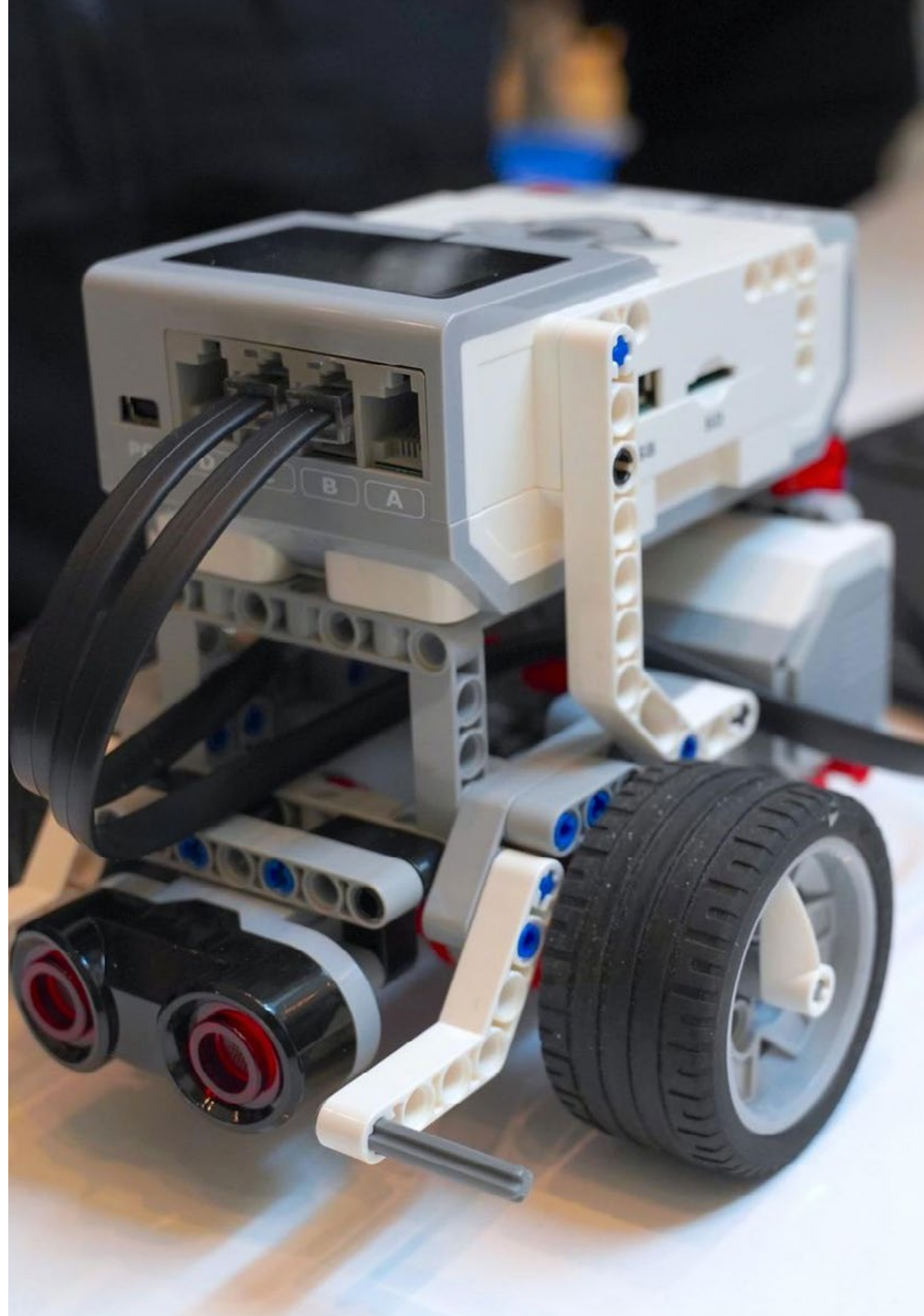
## General Objectives

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- ◆ Understand the mathematical foundations for kinematic and dynamic modeling of robots
- ◆ Delve into the use of specific technologies for the creation of robot architectures, robot modeling and simulation
- ◆ Generate specialized knowledge on Artificial Intelligence
- ◆ Develop the technologies and devices most commonly used in industrial automation
- ◆ Identify the limits of current techniques to identify bottlenecks in robotic applications



*Learn more about robot modeling in virtual environments with this Postgraduate Diploma and enter a booming market"*





## Specific Objectives

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### Module 1. Robotics. Robot Design and Modeling

- ◆ Delve into the use of Gazebo Simulation Technology
- ◆ Master the use of the URDF Robot Modeling language
- ◆ Develop specialized knowledge in the use of Robot Operating System technology
- ◆ Model and simulate manipulator robots, land mobile robots, air mobile robots and model and simulate aquatic mobile robots

### Module 2. Application of Virtual and Augmented Reality Technologies to Robotics

- ◆ 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

### Module 3. Robot Communication and Interaction Systems

- ◆ 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

Robotics involves a complex knowledge of algorithms and programming. Therefore, in this postgraduate diploma, the IT professionals will have at their disposal a teaching team specialized in the field of Robotics with a high academic qualification and experience in the sector. In this way, students will be able to progress in their work environment with the help of experts who will bring the current reality of the field of Robotics in this online program.







“

*A team of professionals specialized in Robotics will guide you to reach your goals in this expanding area”*

## 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
- ♦ Professional 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

### Dr. Íñigo Blasco, Pablo

- ♦ Software Engineer at PlainConcepts
- ♦ Founder of Intelligent Behavior Robots
- ♦ Robotics Engineer at CATEC Advanced Center for Aerospace Technologies
- ♦ Developer and consultant at Syderis
- ♦ PhD in Industrial Informatics Engineering at the University of Seville
- ♦ Degree in Computer Engineering at the University of Seville
- ♦ Master's Degree in Software Engineering and Technology





# 04

## Structure and Content

The syllabus of this program has been prepared by an expert teaching team in the area of Robotics with the aim that students gain up-to-date knowledge in this field. To this end, a syllabus has been designed which was structured in 3 modules that will make an immersion in Industry 4.0, to subsequently, analyze the Virtual Reality and Artificial Intelligence widely demanded, to finally address in detail the communication between the robot and the human being. The video summaries of each topic and the specialized readings will help the students in the course of this program.





“

*Create your own Augmented Reality  
for Robotics projects with this  
Postgraduate Diploma. Enroll now”*

## Module 1. Robotics. Robot Design and Modeling

- 1.1. Robotics and Industry 4.0
  - 1.1.1. Robotics and Industry 4.0
  - 1.1.2. Application Fields and Use Cases
  - 1.1.3. Sub-Areas of Specialization in Robotics
- 1.2. Robot Hardware and Software Architectures
  - 1.2.1. Hardware Architectures and Real-Time
  - 1.2.2. Robot Software Architectures
  - 1.2.3. Communication Models and Middleware Technologies
  - 1.2.4. Robot Operating System (ROS) Software Integration
- 1.3. Mathematical Modeling of Robots
  - 1.3.1. Mathematical Representation of Rigid Solids
  - 1.3.2. Rotations and Translations
  - 1.3.3. Hierarchical State Representation
  - 1.3.4. Distributed Representation of the State in ROS (TF Library)
- 1.4. Robot Kinematics and Dynamics
  - 1.4.1. Kinematics
  - 1.4.2. Dynamics
  - 1.4.3. Underactuated Robots
  - 1.4.4. Redundant Robots
- 1.5. Robot Modeling and Simulation
  - 1.5.1. Robot Modeling Technologies
  - 1.5.2. Robot Modeling with URDF
  - 1.5.3. Robot Simulation
  - 1.5.4. Modeling with Gazebo Simulator
- 1.6. Robot Manipulators
  - 1.6.1. Types of Manipulator Robots
  - 1.6.2. Kinematics
  - 1.6.3. Dynamics
  - 1.6.4. Simulation

- 1.7. Terrestrial Mobile Robots
  - 1.7.1. Types of Terrestrial Mobile Robots
  - 1.7.2. Kinematics
  - 1.7.3. Dynamics
  - 1.7.4. Simulation
- 1.8. Aerial Mobile Robots
  - 1.8.1. Types of Aerial Mobile Robots
  - 1.8.2. Kinematics
  - 1.8.3. Dynamics
  - 1.8.4. Simulation
- 1.9. Aquatic Mobile Robots
  - 1.9.1. Types of Aquatic Mobile Robots
  - 1.9.2. Kinematics
  - 1.9.3. Dynamics
  - 1.9.4. Simulation
- 1.10. Bioinspired Robots
  - 1.10.1. Humanoids
  - 1.10.2. Robots with Four or More Legs
  - 1.10.3. Modular Robots
  - 1.10.4. Robots with Flexible Parts (Soft-Robotics)

## Module 2. Application of Virtual and Augmented Reality Technologies to Robotics

- 2.1. Immersive Technologies in Robotics
  - 2.1.1. Virtual Reality in Robotics
  - 2.1.2. Augmented Reality in Robotics
  - 2.1.3. Mixed Reality in Robotics
  - 2.1.4. Difference between Realities
- 2.2. Construction of Virtual Environments
  - 2.2.1. Materials and Textures
  - 2.2.2. Lighting
  - 2.2.3. Virtual Sound and Smell



- 2.3. Robot Modeling in Virtual Environments
  - 2.3.1. Geometric Modeling
  - 2.3.2. Physical Modeling
  - 2.3.3. Model Standardization
- 2.4. Modeling of Robot Dynamics and Kinematics Virtual Physical Engines
  - 2.4.1. Physical Motors. Typology
  - 2.4.2. Configuration of a Physical Engine
  - 2.4.3. Physical Motors in the Industry
- 2.5. Platforms, Peripherals and Tools Most Commonly Used in Virtual Reality
  - 2.5.1. Virtual Reality Viewers
  - 2.5.2. Interaction Peripherals
  - 2.5.3. Virtual Sensors
- 2.6. Augmented Reality Systems
  - 2.6.1. Insertion of Virtual Elements into Reality
  - 2.6.2. Types of Visual Markers
  - 2.6.3. Augmented Reality Technologies
- 2.7. Metaverse: Virtual Environments of Intelligent Agents and People
  - 2.7.1. Avatar Creation
  - 2.7.2. Intelligent Agents in Virtual Environments
  - 2.7.3. Construction of Multi-User Environments for VR/AR
- 2.8. Creation of Virtual Reality Projects for Robotics
  - 2.8.1. Phases of Development of a Virtual Reality Project
  - 2.8.2. Deployment of Virtual Reality Systems
  - 2.8.3. Virtual Reality Resources
- 2.9. Creating Augmented Reality Projects for Robotics
  - 2.9.1. Phases of Development of an Augmented Reality Project
  - 2.9.2. Deployment of Augmented Reality Projects
  - 2.9.3. Augmented Reality Resources
- 2.10. Robot Teleoperation with Mobile Devices
  - 2.10.1. Mixed Reality on Mobile Devices
  - 2.10.2. Immersive Systems using Mobile Device Sensors
  - 2.10.3. Examples of Mobile Projects



### Module 3. Robot Communication and Interaction Systems

- 3.1. Speech Recognition: Stochastic Systems
  - 3.1.1. Acoustic Speech Modeling
  - 3.1.2. Hidden Markov Models
  - 3.1.3. Linguistic Speech Modeling: N-Grams, BNF Grammars
- 3.2. Speech Recognition Deep Learning
  - 3.2.1. Deep Neural Networks
  - 3.2.2. Recurrent Neural Networks
  - 3.2.3. LSTM Cells
- 3.3. Speech Recognition: Prosody and Environmental Effects
  - 3.3.1. Ambient Noise
  - 3.3.2. Multi-Speaker Recognition
  - 3.3.3. Speech Pathologies
- 3.4. Natural Language Understanding: Heuristic and Probabilistic Systems
  - 3.4.1. Syntactic-Semantic Analysis: Linguistic Rules
  - 3.4.2. Comprehension Based on Heuristic Rules
  - 3.4.3. Probabilistic Systems: Logistic Regression and SVM
  - 3.4.4. Understanding Based on Neural Networks
- 3.5. Dialog Management: Heuristic/Probabilistic Strategies
  - 3.5.1. Interlocutor's Intention
  - 3.5.2. Template-Based Dialog
  - 3.5.3. Stochastic Dialog Management: Bayesian Networks
- 3.6. Dialog Management: Advanced Strategies
  - 3.6.1. Reinforcement-Based Learning Systems
  - 3.6.2. Neural Network-Based Systems
  - 3.6.3. From Speech to Intention in a Single Network







- 3.7. Response Generation and Speech Synthesis
  - 3.7.1. Response Generation: From Idea to Coherent Text
  - 3.7.2. Speech Synthesis by Concatenation
  - 3.7.3. Stochastic Speech Synthesis
- 3.8. Dialog Adaptation and Contextualization
  - 3.8.1. Dialog Initiative
  - 3.8.2. Adaptation to the Speaker
  - 3.8.3. Adaptation to the Context of the Dialogue
- 3.9. Robots and Social Interactions: Emotion Recognition, Synthesis and Expression
  - 3.9.1. Artificial Voice Paradigms: Robotic Voice and Natural Voice
  - 3.9.2. Emotion Recognition and Sentiment Analysis
  - 3.9.3. Emotional Voice Synthesis
- 3.10. Robots and Social Interactions: Advanced Multimodal Interfaces
  - 3.10.1. Combination of Vocal and Tactile Interfaces
  - 3.10.2. Sign Language Recognition and Translation
  - 3.10.3. Visual Avatars: Voice to Sign Language Translation



*Set yourself the challenge and improve verbal and emotional communications in robots. Enroll now”*

# 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.





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



## Case Study to contextualize all content

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

“

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



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





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

### A learning method that is different and innovative

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

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

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

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

## Relearning Methodology

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

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

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

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

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



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

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

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

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

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



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



### Study Material

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

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



### Classes

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

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



### Practising Skills and Abilities

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



### Additional Reading

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







#### Case Studies

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



#### Interactive Summaries

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

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



#### Testing & Retesting

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



# 06 Certificate

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





“

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

This **Postgraduate Diploma in Robot Interaction Tools** 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 certificate 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 Robot Interaction Tools**

Official N° of Hours: **450 h.**



\*Apostille Convention. In the event that the student wishes to have their paper certificate 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



## Postgraduate Diploma Robot Interaction Tools

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

# Postgraduate Diploma Robot Interaction Tools

