Postgraduate Diploma

Robot Interaction Tools

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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.techtitute.com/pk/engineering/postgraduate-diploma/postgraduate-diploma-robots-interaction-tools**

Index

01

Introduction

Dialog between human and robot was a chimera until a few decades ago. However, technological progress and the work of engineering has led to undeniable progress in this field. This 100% online program focuses on the development of communication with machines and all the systems involved in Virtual and Augmented Reality. All this, with a material with quality content and at the forefront of academic education and that provides students with a specialization that allows them to progress in their careers in an expanding sector.

Acquire the most advanced knowledge in robot design and modeling with this Postgraduate Diploma. You are one click away from enroll"

This program oriented toward engineering professionals provides extensive knowledge in the field of robot communication thanks to the study plan developed by a specialized teaching team with extensive experience in this field.

A teaching, taught in a completely online mode, which also delves into Virtual and Augmented Reality. A field where advances in machine vision and image synthesis techniques are the main culprits of this progress. This 6-month program will provide students with the latest knowledge about this technology that allows, among other things, robots to perform the tasks that carry more risk (work at height, work in toxic environments, tasks near dangerous places such as volcanoes, etc.) in a fully teleoperated way.

Likewise, this specialization allows the engineering professional to transfer the mathematical models of the robots to the physical engines that we will find in the Virtual Reality tools and to detect the main points to carry out a 3D rendering.

All this, with a teaching system that allows the student's personal responsibilities to be compatible with a quality program that can be accessed at any time of the day. The only thing the professional needs is an electronic device with an internet connection to be able to access all the contents of the study plan from the first day.

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 the self-assessment process can be carried out 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

Enroll now and grow professionally in the field of Virtual and Augmented Reality"

Enroll now in a Postgraduate Diploma that will allow you to perfect all your knowledge in robot modeling technologies"

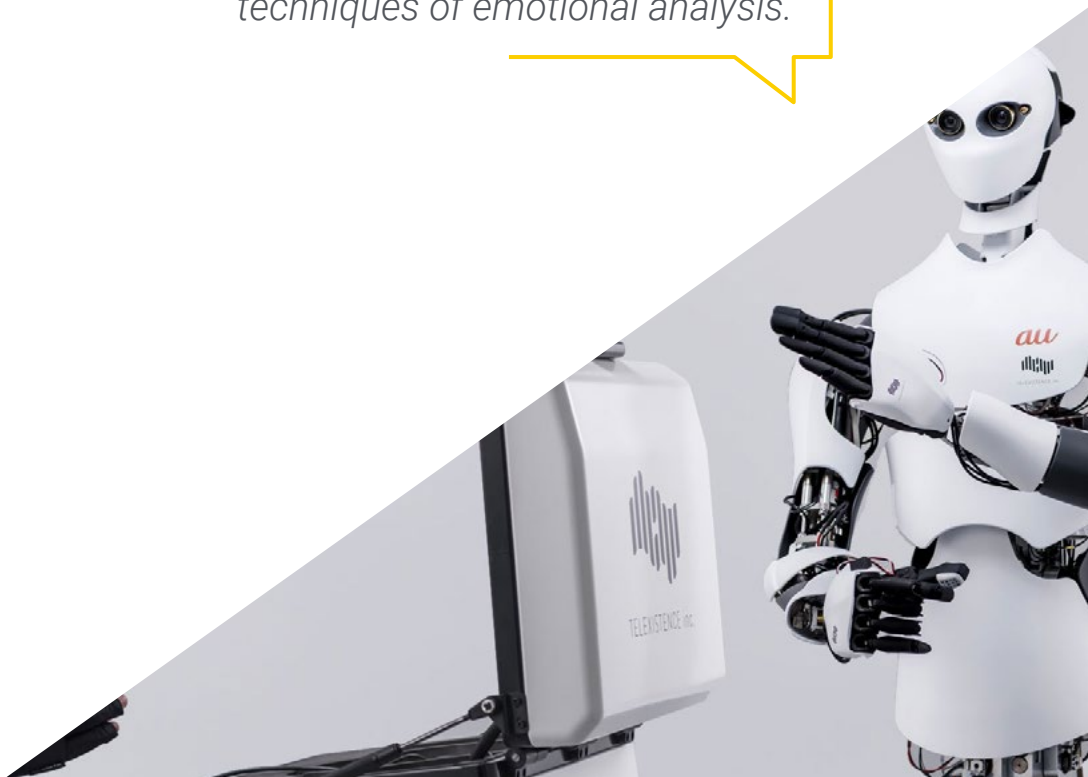
The real cases provided by the teaching team will be very useful and applied in the field of Engineering.

Obtain the optimal expressiveness of the robot according to its functionality and environment, and apply the latest techniques of emotional analysis.

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, the student will be assisted by an innovative interactive video system created by renowned experts.



02

Objectives

During this Postgraduate Diploma, the engineering professionals will acquire the latest knowledge in the field of Robotics, especially focused on modeling and design. Also, upon completion, they will be able to launch their own projects or be part of the main companies in the industry that demand professionals specialized in Virtual and Augmented Reality. A learning process in which students will not be alone, since they will have a teaching team with extensive professional experience in this area.

Achieve your professional goals with a specialization that will allow you to implement any project that facilitates the robot-human dialogue"

General Objectives

- 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

Specific Objectives

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 Reality 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

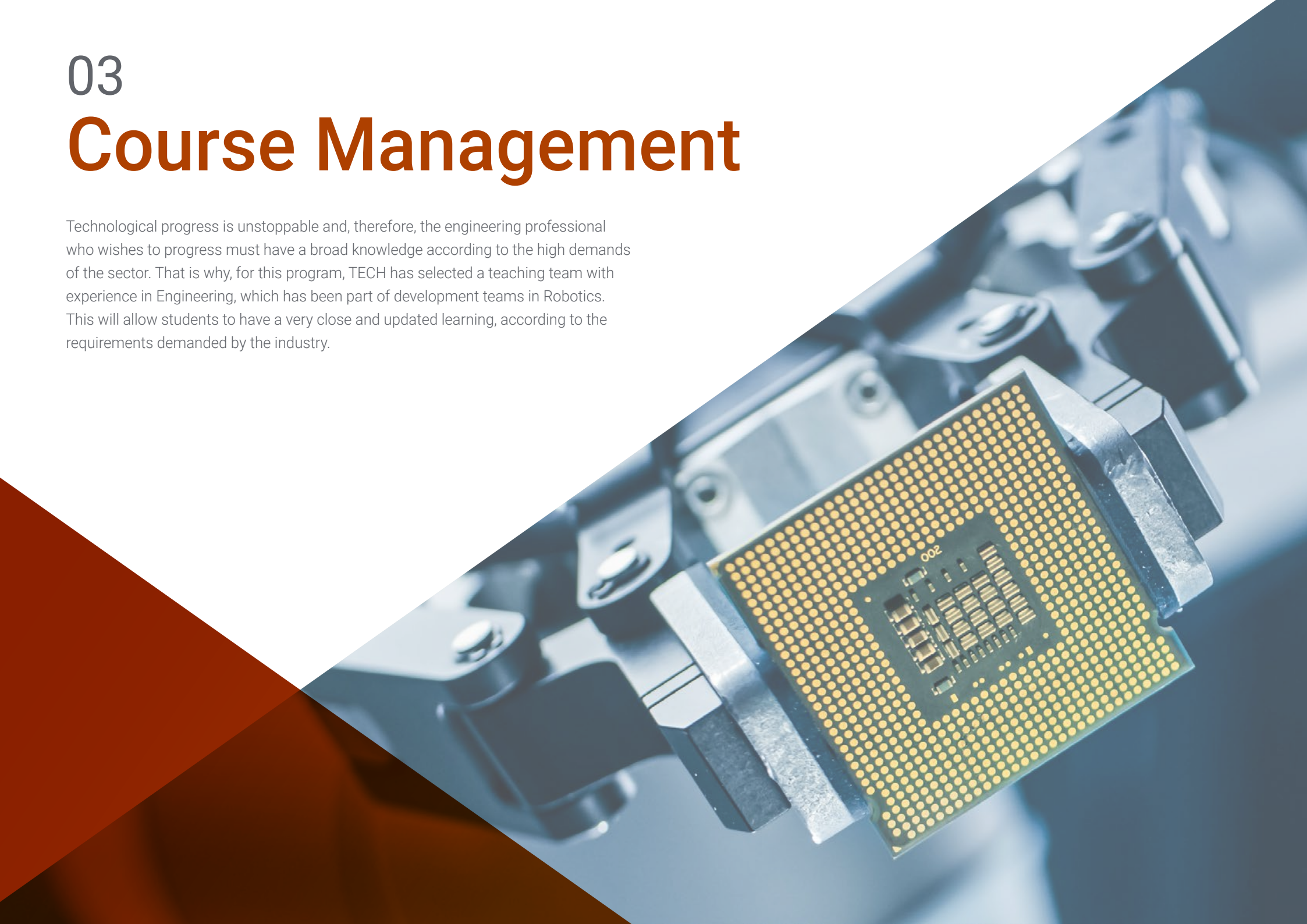
- Analyze current natural language processing strategies: heuristic, stochastic, neural network-based, reinforcement-based learning
- Assess the benefits and weaknesses of developing cross-cutting, or situation-focused, interaction systems
- Identify the environmental problems to be solved in order to 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

Understand heuristic and probabilistic natural language systems and their application in Robotics"

03

Course Management

Technological progress is unstoppable and, therefore, the engineering professional who wishes to progress must have a broad knowledge according to the high demands of the sector. That is why, for this program, TECH has selected a teaching team with experience in Engineering, which has been part of development teams in Robotics. This will allow students to have a very close and updated learning, according to the requirements demanded by the industry.



Success is closer. Click and enroll in a Postgraduate Diploma where you will learn from the best in the Robotics sector"

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 Dialog 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
- Professional Master's Degree in Software Engineering and Technology


02
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04

Structure and Content

The syllabus of this Postgraduate Diploma has been proposed by a specialized team that seeks, as its first objective, the quality of the teaching received by the students. Thus, it has created a syllabus with video summaries of each topic, essential readings and videos in detail that facilitate the learning of the 3 modules in which all the content has been structured. With a theoretical-practical approach and updated material, the engineering professional will conclude this program with a complete specialization in the field of Robotics.

A library of multimedia resources and state-of-the-art academic teaching will provide you with the most up-to-date learning in the field of Robotics"

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

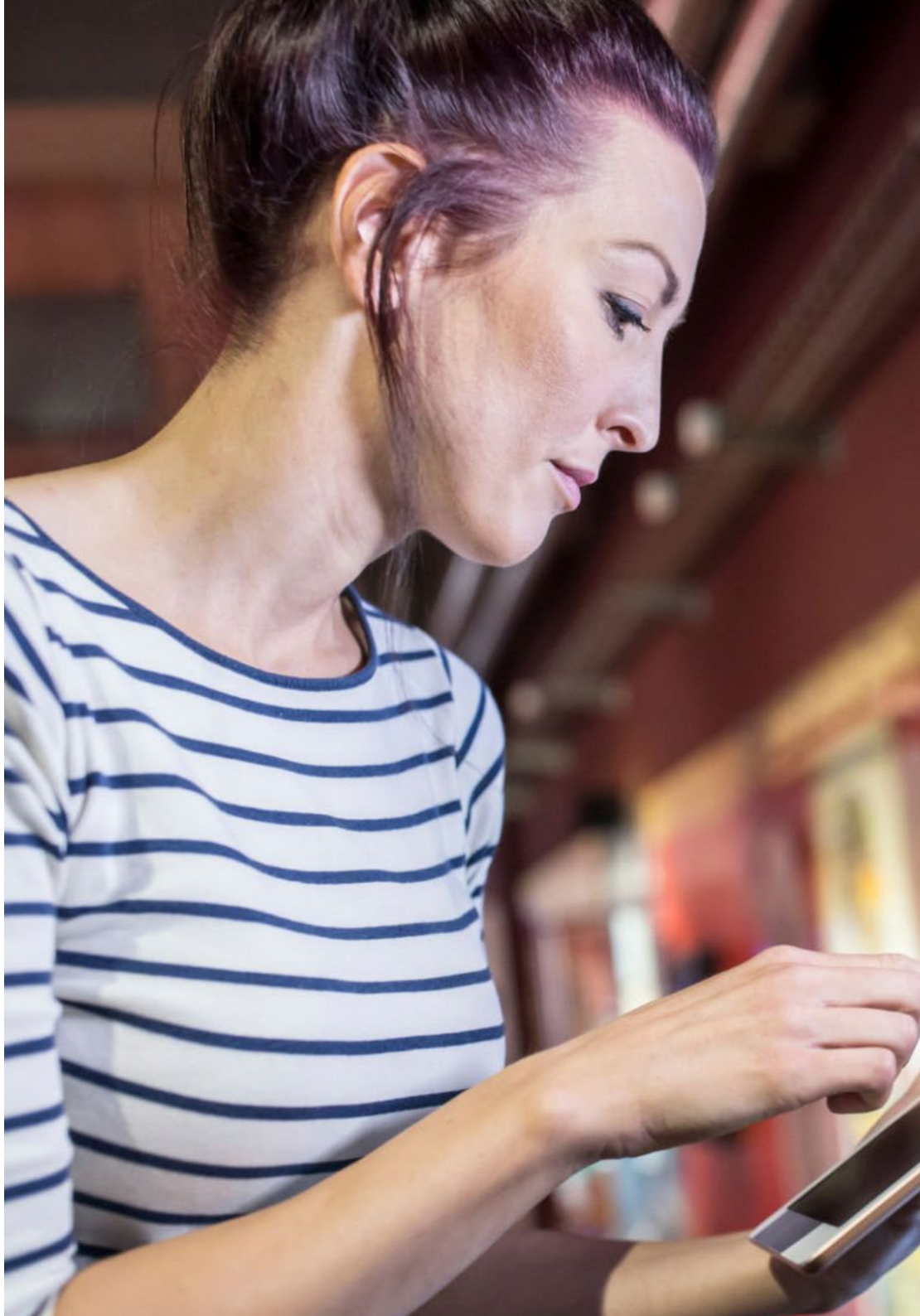
1.2. Robot Hardware and Software Architectures
- 1.2.1. Hardware Architectures and Real-Time
- 1.2.2. Robot Software Architectures
- 1.2.3. Communication Models and Middleware Technologies
- 1.2.4. Robot Operating System (ROS) Software Integration

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. Bio-Inspired 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

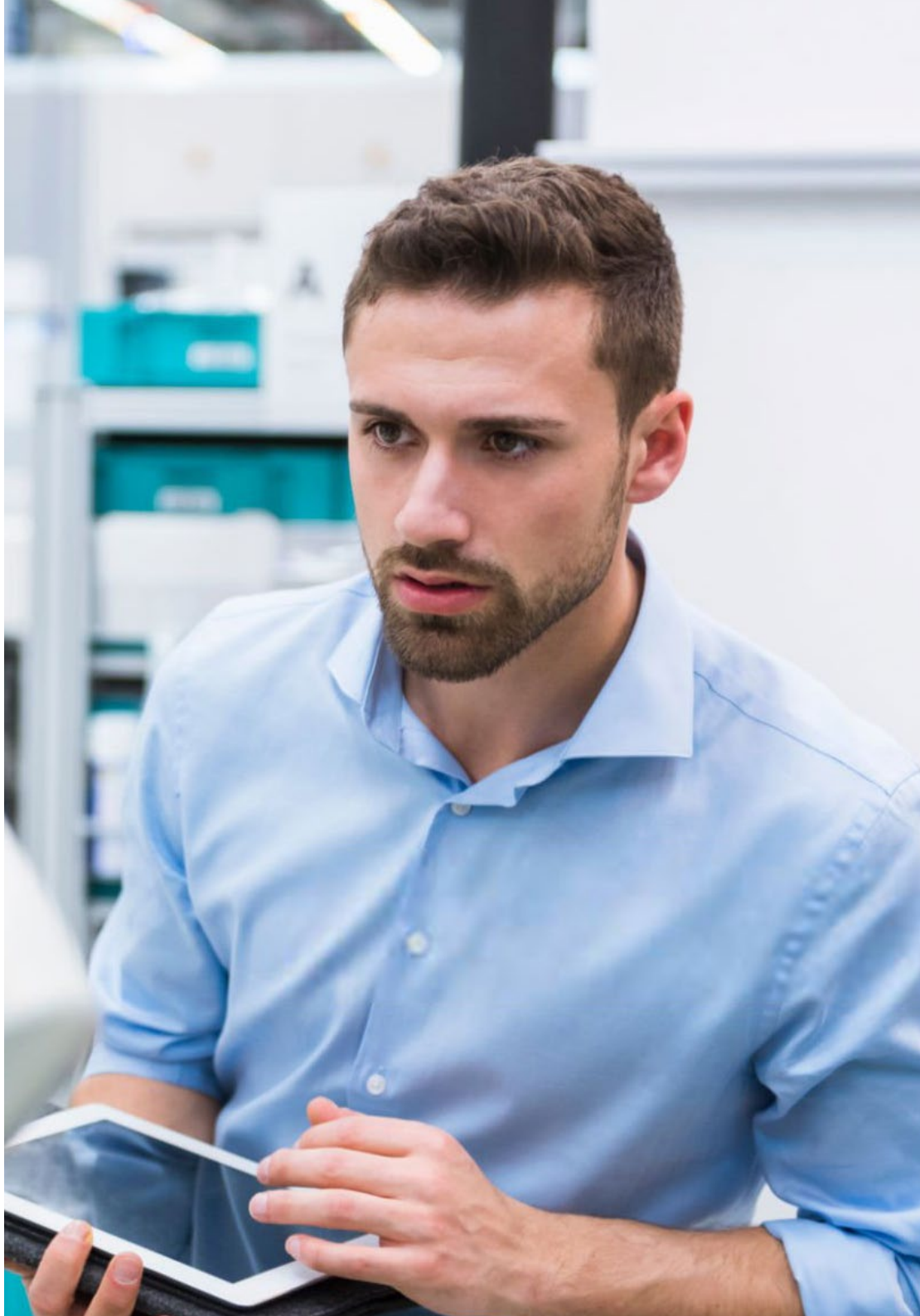
2.6. Augmented Reality Systems
- 2.6.1. Insertion of Virtual Elements into Reality
- 2.6.2. Types of Visual Markers
- 2.6.3. Augmented Reality Technologies

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

Master the main techniques of Robot teleoperation with Mobile Devices thanks to this Postgraduate Diploma"

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 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

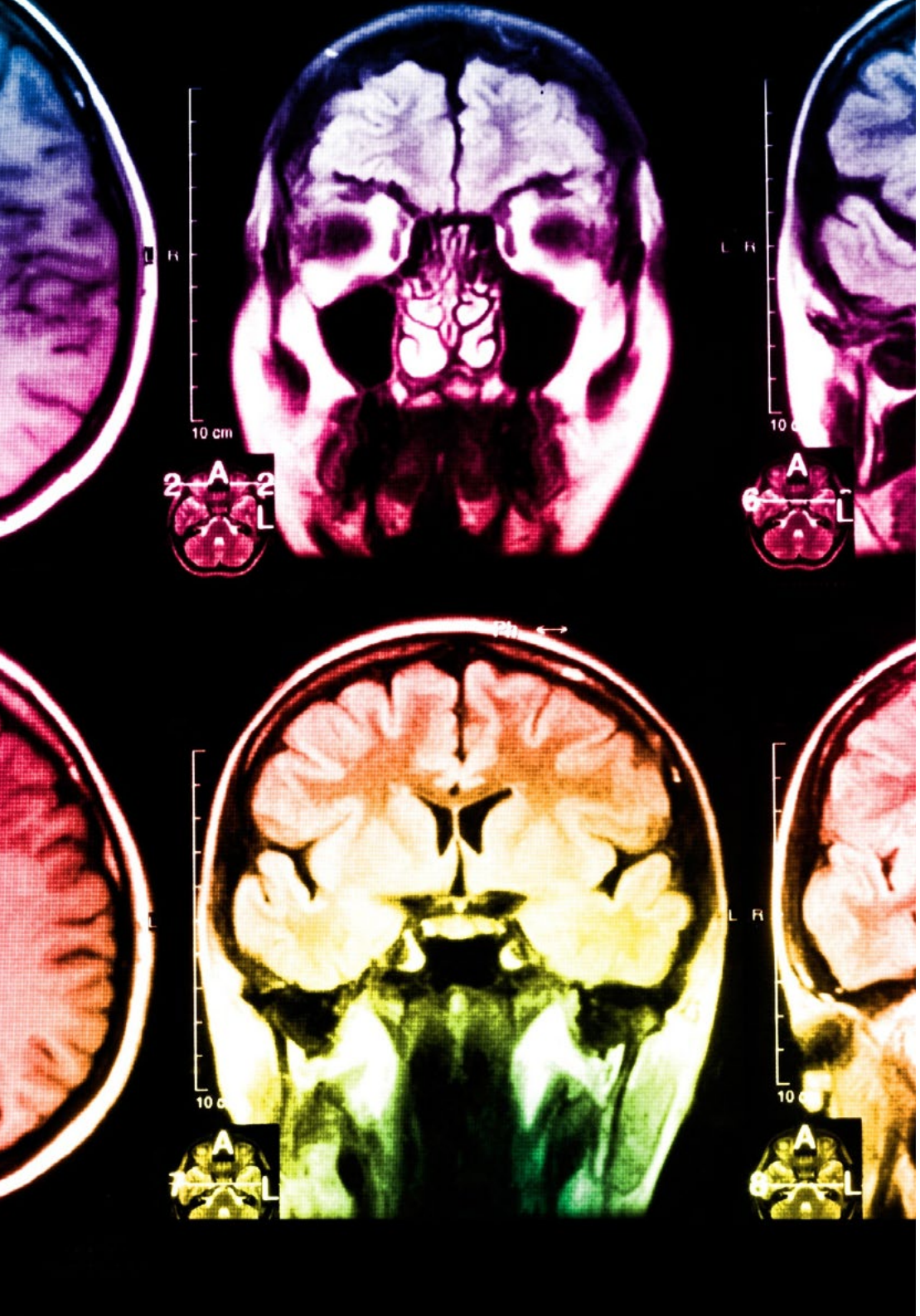
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines 8 different teaching elements in each lesson.

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.

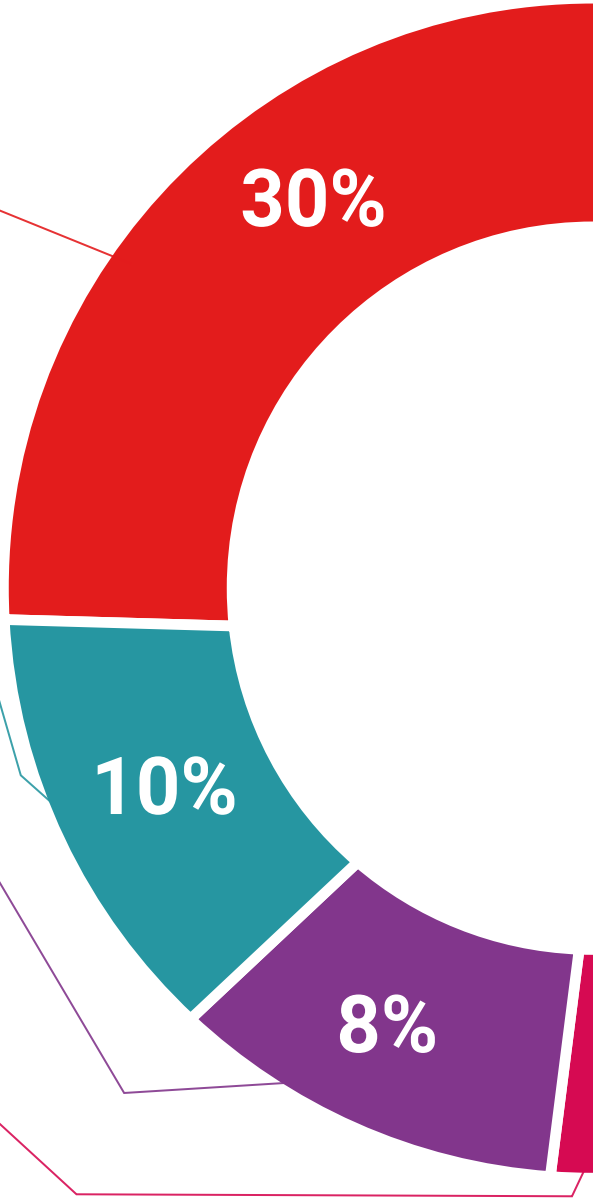
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

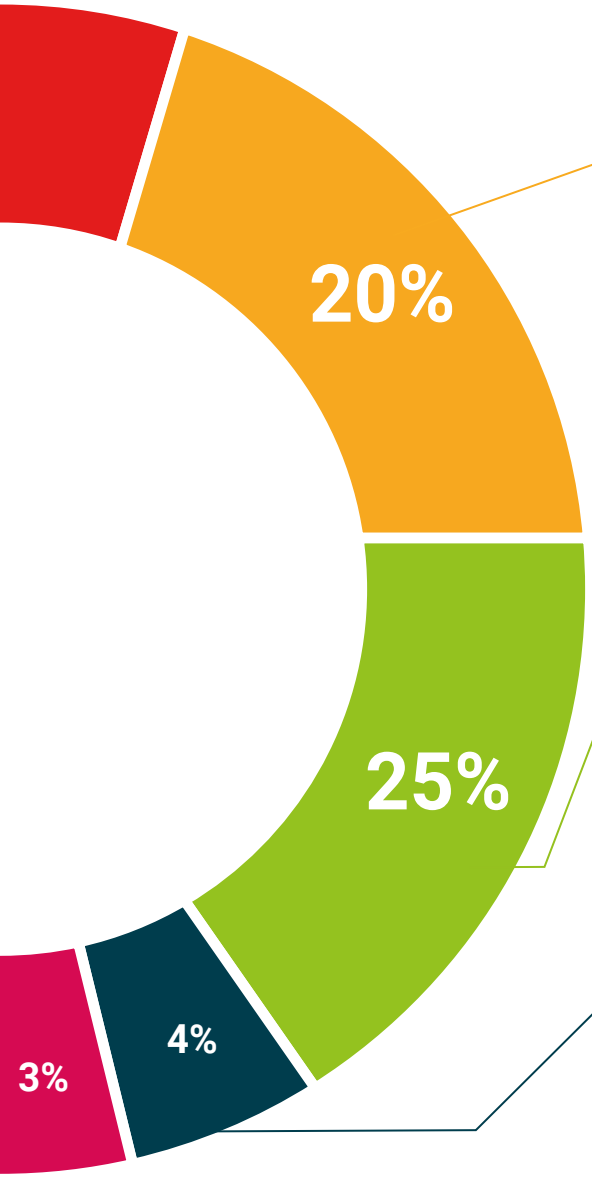
Practising Skills and Abilities

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.

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 Postgraduate Certificate 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 Nº of Hours: **450 h.**


tech technological university

Awards the following

CERTIFICATE

to

Mr./Ms. _____, with identification number _____.

For having passed and accredited the following program

POSTGRADUATE DIPLOMA

in

Robot Interaction Tools

This is a qualification awarded by this University, equivalent to 450 hours, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

TECH is a Private Institution of Higher Education recognized by the Ministry of Public Education as of June 28, 2018.

June 17, 2020

Tere Guevara Navarro

Dean

This qualification must always be accompanied by the university degree issued by the competent authority to practice professionally in each country. Unique TECH Code: AFWORD23S techtitute.com/certificates

*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.

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